

A high-contrast, black and white photograph of an astronaut's boot print on the lunar surface. The boot print is in the foreground, showing the tread pattern. The background is the craggy, rocky surface of the moon.

Apollo 11

Technical Air-to-Ground Voice Transcription

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

A large, light blue, semi-transparent watermark of the Apollo 11 mission patch is visible in the background of the lower section. The patch features an eagle with wings spread, a globe, and the text 'APOLLO 11'.

**MANNED SPACECRAFT CENTER
HOUSTON, TEXAS**

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

626p15

APOLLO 11
TECHNICAL AIR-TO-GROUND VOICE TRANSCRIPTION
(GOSS NET 1)

Prepared for
Data Logistics Office
Test Division
Apollo Spacecraft Program Office



MANNED SPACECRAFT CENTER
HOUSTON, TEXAS

July 1969

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Apollo 11 Air-to-Ground Voice Transcription

July 16 – 24, 1969

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

INTRODUCTION

This is the transcription of the Technical Air-to-Ground Voice Transmission (GOSS NET 1) from the Apollo 11 mission.

Communicators in the text may be identified according to the following list.

Spacecraft:

| | | |
|-----|----------------------------------|----------------------|
| CDR | Commander | Neil A. Armstrong |
| CMP | Command module pilot | Michael Collins |
| LMP | Lunar module pilot | Edwin E. ALdrin, Jr. |
| SC | Unidentifiable crewmember | |
| MS | Multiple (simultaneous) speakers | |
| LCC | Launch Control Center | |

Mission Control Center:

| | |
|----|---------------------------------|
| CC | Capsule Communicator (CAP COMM) |
| F | Flight Director |

Remote Sites:

| | |
|----|---------------------------------------|
| CT | Communications Technician (COMM TECH) |
|----|---------------------------------------|

Recovery Forces:

| | |
|--------|---------------------|
| HORNET | USS Hornet |
| R | Recovery helicopter |
| AB | Air Boss |

A series of three dots (...) is used to designate those portions of the communications that could not be transcribed because of garbling. One dash (-) is used to indicate a speaker's pause or a self-interruption and subsequent completion of a thought. Two dashes (- -) are used to indicate an interruption by another speaker or a point at which a recording was terminated abruptly.

Tape 1/1 — Page 1

MILA (REV 1)

00 00 00 04 CDR

Roger. Clock.

00 00 00 13 CDR

Roger. We got a roll program.

00 00 00 15 CC

Roger. Roll.

00 00 00 34 CDR

Roll's complete and the pitch is programed.

00 00 00 44 CDR

One Bravo.

00 00 01 02 CC

Apollo 11, Houston. You're good at 1 minute.

00 00 01 06 CDR

Roger.

00 00 01 54 CC

Stand by for mode 1 Charlie.

00 00 01 57 CC

MARK.

00 00 01 58 CC

Mode 1 Charlie.

00 00 01 59 CDR

One Charlie.

00 00 02 03 CC

Apollo 11, this is Houston. You are GO for staging.

00 00 02 17 CDR

Inboard cut-off.

00 00 02 19 CC

We confirm inboard cut-off.

00 00 02 44 CDR

Staging.

00 00 02 46 CDR

And ignition.

00 00 02 55 CC

11, Houston. Thrust is GO, all engines. You're looking good.

00 00 02 59 CDR

Roger. You're loud and clear, Houston.

00 00 03 13 CDR

We've got skirt SEP.

00 00 03 15 CC
Roger. We confirm. Skirt SEP.

00 00 03 17 CDR
Tower's gone.

00 00 03 19 CC
Roger. Tower.

00 00 03 28 CDR
Houston, be advised the visual is GO today.

00 00 03 32 CC
This is Houston. Roger. Out.

Tape 1/2 — Page 2

00 00 03 36 CDR
Yes. They finally gave me a window to look out.

00 00 03 44 CC
11, Houston. Your guidance has converged; you're looking good.

00 00 03 52 CDR
Roger.

00 00 04 01 CC
11, Houston. YOU are GO at 4 minutes.

00 00 04 04 CDR
Roger.

00 00 05 03 CC
11, Houston. You are GO at 5 minutes.

00 00 05 06 CDR
Roger. It'll - Apollo 11. Go.

00 00 05 21 CC
Stand by the S-IVB to COI capability.

00 00 05 25 CDR
Okay.

00 00 05 27 CC
MARK.

00 00 05 28 CC
S-IVB to COI capability.

00 00 05 30 CDR
Roger.

00 00 05 35 CDR
You sure sound clear down there, Bruce. Sounds like you're sitting in your living room.

00 00 05 39 CC
Oh, thank you. You all are coming through beautifully, too.

00 00 06 00 CDR
We're doing 6 minutes. Starting the gimbal motors.

00 00 06 03 CC
Roger, 11. You're GO from the ground at 6 minutes.

00 00 06 20 CC
Apollo 11, this is Houston. Level sense arm at 8 plus 17; outboard cut-off at 9 plus 11.

00 00 07 01 CDR
Apollo 11's GO at 7 minutes.

00 00 07 04 CC
11, this is Houston. Roger. You're GO from the ground at 7 minutes. Level sense arm at 8 plus 17; outboard cut-off at 9 plus 11.

00 00 07 09 CDR
Roger.

00 00 07 42 CDR
Inboard cut-off.

00 00 07 45 CC
Roger. We confirmed.

00 00 08 19 CC
Apollo 11, Houston. You are GO at 8 minutes.

Tape 1/3 — Page 3

00 00 08 22 CDR
AGS just got the mixture ratio shift.

00 00 08 24 CC
Roger. We got PU shift down here, too.

00 00 08 34 CDR
Well, it looks like a nice day for it. These thunderstorms down range is about all.

GRAND BAHAMA ISLANDS (REV 1)

00 00 08 52 CC
11, this is Houston. You are GO for staging. Over.

00 00 08 56 CDR
Understand, GO for staging. And - -

00 00 08 57 CC
Stand by for mode IV capability.

00 00 08 59 CDR
Okay. Mode IV.

00 00 09 00 CC
MARK.

00 00 09 01 CC
Mode IV capability.

00 00 09 15 CDR
Staging -

00 00 09 16 CDR
- And ignition.

00 00 09 19 CC
Ignition confirmed; thrust is GO, 11.

00 00 10 01 CC
Apollo 11, this is Houston. At 10 minutes, you are GO.

00 00 10 06 CDR
Roger. 11's GO.

00 00 10 24 CC
Apollo 11, this is Houston. Predicted cut-off at 11 plus 42. Over.

00 00 10 29 CDR
11 42. Roger.

00 00 11 03 CC
Apollo 11, this is Houston. You are GO at 11.

00 00 11 08 CDR
Good deal.

00 00 11 42 CDR
Shutdown.

00 00 11 45 CMP
SECO. We are showing 101.4 by 103.6.

00 00 11 51 CC
Roger. Shutdown. We copy 101.4 by 103.6.

00 00 12 06 CC
Apollo 11, this is Houston. You are confirmed GO for orbit.

Tape 1/4 — Page 4

00 00 12 12 CDR
Roger.

00 00 12 24 CC
Apollo 11, this is Houston. The booster is safe.

00 00 12 29 CDR
Roger.

VANGUARD (REV 1)

00 00 13 27 CC
Apollo 11, this is Houston. The booster has been configured for orbital coast. Both spacecraft are looking good. Over.

00 00 13 35 CDR
Roger.

00 00 14 33 CC

Apollo 11, this is Houston. Vanguard LOS at 15 35; AOS Canaries at 16 30. Over.

00 00 14 43 CDR

Okay. Thank you.

CANARY (REV 1)

00 00 17 38 CT

... Houston COMM TECH. Canary COMM TECH.

00 00 18 18 CC

Apollo 11, this is Houston through Canary. Over.

00 00 18 23 CDR

Roger. Reading you loud and clear. Our insertion checklist is complete, and we have no abnormalities.

00 00 18 30 CC

Roger. And I'd like to pass up your Delta azimuth correction at this time if you're ready to copy.

00 00 18 36 CDR

Stand by.

00 00 18 40 CDR

Roger. Go ahead. Ready to copy.

00 00 18 42 CC

Okay. Delta azimuth correction is plus 0.22, that is plus 0.22, and we do recommend the P52 alignment. Over.

00 00 18 54 CDR

Okay. We'll go ahead with the P52, and detecting angle plus 0.22.

00 00 19 01 CC

Roger. And your LOS time at Canary is 23 37. Over.

00 00 19 09 CDR

23 37.

Tape 1/5 — Page 5

00 00 19 11 CC

Houston. Roger. Out.

00 00 22 41 CC

Apollo 11, this is Houston. One minute to LOS Canary; AOS at Tananarive 37 04 in VHF Simplex Alfa. Over.

00 00 23 08 CC

Apollo 11, this is Houston. Coming up on LOS Canary; AOS Tananarive at 37 04, Simplex Alfa. Houston. Out.

00 00 23 23 CDR

Apollo. Roger.

TANANARIVE (REV 1)

00 00 38 37 CC

Apollo 11, this is Houston through Tananarive. Over.

00 00 38 50 CC

Apollo 11, Apollo 11, this is Houston through Tananarive. Over.

00 00 39 04 CDR

Houston, Apollo 11. Read you on VHF A Simplex. How do you read? Over.

00 00 39 10 CC

Roger, 11. This is Houston. We're reading you loud and fairly clearly. For your information, Canary radar shows you in a 103.0 by 103.0 orbit. Over.

00 00 39 25 CDR

Beautiful.

00 00 39 27 CC

Roger. We concur.

00 00 39 31 CDR

... We're just coming into the terminator here.

00 00 41 44 CC

Apollo 11, this is Houston. One minute to LOS Tananarive; AOS Carnarvon is at 52 15. Over.

00 00 41 54 CDR

All alone. Roger.

00 00 43 13 CT

TAN LOS.

CARNARVON (REV 1)

00 00 53 03 CC

Apollo 11, this is Houston through Carnarvon. Over.

00 00 53 08 LMP

Houston, Apollo 11. Loud and clear. Over.

Tape 1/6 — Page 6

00 00 53 11 CC

Roger, 11. We're reading you the same. Both the booster and the spacecraft are looking good to us. Over.

00 00 53 26 LMP

Houston, Apollo 11. Would you like to copy the alignment results?

00 00 53 31 CC

That's affirmative.

00 00 53 35 LMP

Okay. NOUN 71: we used 30 and 37, four balls 1; NOUN 93: plus 00016, plus 00033, plus 00152; GET 00 48 15; check star 34. Over.

00 00 54 02 CC

Roger. Say again check star.

00 00 54 06 LMP

Check star 34.

00 00 54 09 CC

Roger. We copy. And the angles look good.

00 00 54 13 CMP

And tell Glenn Parker down at the Cape that he lucked out.

00 00 54 17 CC

Understand. Tell Glenn Parker he lucked out.

00 00 54 22 CMP

Yes. He lucked out. He doesn't owe me a cup of coffee.

00 00 54 26 CC

This is Houston. Roger. We'll pass it on.

00 00 57 27 CC

Apollo 11, this is Houston. One minute to LOS Carnarvon; AOS at Honeysuckle 59 33. Over.

00 00 57 37 CDR

Apollo 11. Roger.

00 00 57 40 CC

Roger. And we request you turn up S-band volume for the Honeysuckle pass.

HONEYSUCKLE (REV 1)

00 01 02 48 CC

Apollo 11, Apollo 11, this is Houston on S-band. Radio check. Over.

00 01 02 55 CDR

Roger, Houston. Apollo 11 reads you loud and clear.

00 01 02 58 CC

This is Houston. Roger. Reading you the same. Out.

00 01 04 24 CC

Apollo 11, this is Houston. A little over 1 minute to LOS at Honeysuckle. You'll be AOS at Goldstone at 1 29 02; LOS at Goldstone 1 33 55. Over.

Tape 1/7 — Page 7

00 01 04 47 CMP

Roger, Bruce. Thank you. We expect TV. We've got it all hooked up. We have not yet turned it on. We're ready to do that now.

00 01 04 55 CC

Roger. We copy. We'll be configured and waiting for whatever you want to send down.

GUAYMAS (REV 1)

00 01 29 09 CC

Apollo 11, this is Houston through Guaymas. Over.

00 01 29 14 CDR

Roger, Houston. Reading you loud and clear.

00 01 29 17 CC

Roger. Reading you the same. Coming up on AOS Goldstone.

00 01 29 20 CDR

Roger.

END OF TAPE

Tape 1/8 — Page 8

NOTE

Subsequent to TLI, there is continuous acquisition among Goldstone (GDS), Madrid (MAD), and Honeyuckle (HSK).

Tape 2/1 — Page 9

GUAYMAS (REV 1)

00 01 29 27 LMP

Cecil B. deAldrin is standing by for instructions.

00 01 29 32 CC

Houston. Roger.

00 01 31 15 CC

Apollo 11, this is Houston. We are not receiving your FM downlink yet. We are standing by.

00 01 31 56 CC

Apollo 11, this is Houston. We are receiving your FM downlink now. We are standing by for TV modulations on the signal.

00 01 32 23 CC

Apollo 11, Apollo 11, this is Houston. Radio check. Over.

GOLDSTONE (REV 1)

00 01 32 27 CDR

Roger. Loud and clear. We think we are transmitting to you.

00 01 32 31 CC

Okay. We are not receiving it yet, 11, although we have confirmed presence of your FM downlink carrier.

00 01 32 39 CDR

Which switches do you want us to confirm?

00 01 32 42 CC

Stand by.

TEXAS (REV 1)

00 01 33 11 CC

Apollo 11, this is Houston. You were just on the fringes of coverage from Goldstone. We have just had LOS at Goldstone, and we'd like to push on and get the PAD messages read up to you here shortly.

00 01 33 26 CDR

Roger. We are ready to copy.

00 01 34 33 CC

Apollo 11, this is Houston. I am ready with your TLI-plus-90-minute abort PAD.

00 01 34 55 CC

Apollo 11, this is Houston. I am ready with your TLI-plus-90-minute abort PAD.

Tape 2/2 — Page 10

00 01 35 00 CDR

Roger. Apollo 11 is ready to copy TLI plus 90.

00 01 35 03 CMP

Go.

00 01 35 05 CC

Roger. TLI plus 90, SPS G&N: 63481, minus 153, plus 132; GETI 004 10 25 38; NOUN 81, minus 04761, plus 00001, plus

53361; roll 180 193 000; HA is NA; plus 00203 53573 633 53349, sextant star 33 1578 122. The boresight star is not available. Latitude minus 0252, minus 02580 11887 34345 016 03 50. GDC align Vega and Deneb. Roll 071 291 341. No ullage, undocked. I have your P37 for TLI plus 5 hours. Over.

00 01 37 08 CMP
Go ahead, TLI plus 5.

00 01 37 11 CC
Roger. P37 format, TLI plus 5: 00744 6485, minus 165, 02506. Read back. Over.

00 01 37 31 CMP
Roger. TLI plus 90, SPS G&N: 63481, minus 153, plus 132, 004 10 25 38, minus 04761, plus 00001, plus 53361, 180 193 000, not applicable, plus 00203 53573 633 53349, 33 1578 122, not available, minus 0252, minus 02580 11887 34345 016 03 50. Vega and Deneb, 071 291 341. No ullage, undocked. P37, TLI plus 5: 00744 6485, minus 165 02506. Over.

00 01 39 04 CC
Apollo 11, this is Houston. Readback correct. For your information, Goldstone reports receiving approximately 1 minute of FM downlink carrier. We were getting ready to request you confirm on the S-band AUX switches, the S-band AUX tape switch to OFF and the S-band AUX TV switch to TV. Over.

00 01 39 29 CDR
I confirm that that is the configuration we're in.

00 01 39 33 CC
Roger. Let us do a little more detective work here and we'll see if we can come up with something.

00 01 39 38 CDR
Okay.

00 01 39 54 CDR
Houston, Apollo 11 is ready to go ahead with the - extend the docking probe, and ready to go with the RCS hot fire when you're ready to monitor. Over.

00 01 40 06 CC
Roger. Go ahead with the probe, now.

Tape 2/3 — Page 11

00 01 40 13 CDR
Roger.

00 01 41 33 CDR
Okay. We're ready to - for the hot fire check when you're ready.

00 01 41 39 CC
Roger. We're ready 11. Go ahead.

00 01 41 48 CDR
Roger. Here's the pitch.

00 01 42 13 CC
Apollo 11, this is Houston. We are seeing the pitch hot firing and it looks good.

00 01 42 18 CDR
Roger. Be advised that we are unable to hear them.

00 01 42 22 CC
Roger. We copy.

00 01 42 24 CDR
Have you seen all three axes fire?

00 01 42 31 CC
We've seen pitch and yaw; we've not seen roll to date.

00 01 42 36 CDR
Okay. I'll put in a couple more rolls.

00 01 42 42 CC
Okay. We've got the roll impulses, and you're looking good here.

00 01 42 48 CDR
Roger. Houston, Apollo 11. We're standing by for a GO for sequence logic ON.

00 01 43 03 CC
Apollo 11, this is Houston. Go ahead and we'll watch you on TM.

00 01 43 07 CDR
Okay. Sequence logic, two of them. Sequence logic 1 and 2 coming up and ON.

GRAND BAHAMA ISLANDS (REV 2)

00 01 43 36 CC
Apollo 11, this Houston. You are GO for RYRO ARM.

00 01 43 40 CDR
Roger. Thank you.

00 01 43 57 CC
Apollo 11, this is Houston. If you will give us P00 in ACCEPT, we have a state vector update for you.

00 01 44 04 CDR
Roger.

00 01 44 17 CDR
You have P00 in ACCEPT.

Tape 2/4 — Page 12

00 01 44 19 CC
Roger. It will probably be another 10 or 15 seconds. We're going to go up through the Vanguard. When you are ready to copy, I have your TLI PAD.

00 01 44 26 CMP
Roger. Ready to copy TLI PAD.

00 01 44 30 CC
Roger. TLI: 23514 179 071 001, burn time 547 104356 35575. Roll for SEP 357 107 041, 301 287 319. TLI 10-minute abort pitch, 223. Read back. Over.

VANGUARD (REV2)

00 01 45 23 CMP
Roger. TLI PAD: 23514 179 071 001 547 104356 35575 357 107 041 301 287 319. TLI 10-minute abort pitch, 223. Over.

00 01 46 03 CC
Apollo 11, this is Houston. Roger. Would you read back DELTA-VC prime again? You were cut out by some noise.

00 01 46 09 CMP

Okay. Roger. I'm picking up the squeal here, also. DELTA-VC 104356. Over.

00 01 46 25 CC

Apollo 11, this is Houston. Readback correct. Out.

00 01 47 06 CC

Apollo 11, this is Houston. We've completed the uplink; the computer is yours. You can go back to BLOCK. Would you verify that you have extended the probe? Over.

00 01 47 16 CDR

Roger. That's verified; the probe is extended.

00 01 47 19 CC

Roger. About 2 minutes to LOS on this stateside pass. AOS Canaries at 1 50 13. Over.

00 01 47 28 CDR

Roger. 1 50.

CANARY (REV 2)

00 01 50 42 CC

Apollo 11, this is Houston. Over.

00 01 50 45 CDR

Roger. Houston, Apollo 11. Loud and clear.

Tape 2/5 — Page 13

00 01 50 49 CC

Okay. On your service module RCS quad Bravo package temperature, we're showing it running a little low. Looks like about 20 degrees low - lower than the rest of the quads. Would you confirm that your RCS heater switch for quad Bravo is in PRIMARY? Over.

00 01 51 09 CDR

You're correct. It was not in PRIMARY. It was off. It's on now. Thank you.

00 01 51 16 CC

Roger. Thank you.

00 01 53 50 CC

Apollo 11, this is Houston. Over.

00 01 53 54 CMP

Houston, Apollo 11. Go ahead.

00 01 53 56 CC

Roger. We've checked over the spacecraft and the launch vehicle guidance. They're both looking to be in good shape. We estimate you have better than a 99-percent probability of a guidance cut-off on the launch vehicle, so things are apparently holding in very well. For your information, MILA received approximately 1 minute of a usable TV picture, so apparently the system is working. And you're a little over a minute from LOS at Canary; AOS Tananarive is 2 hours 9 minutes and 18 seconds. Over.

00 01 54 34 CMP

Roger. We like those 99 numbers. Thank you.

00 01 54 38 CC

Roger. Out.

TANANARIVE (REV 2)

00 02 09 17 CC
Apollo 11, this is Houston through Tananarive. How do you read?

00 02 09 45 CC
Apollo 11, this is Houston standing by through Tananarive.

00 02 10 03 CT
Tananarive, Houston COMM TECH NET 1.

00 02 10 12 CT
Tananarive, Houston COMM TECH NET 1.

00 02 10 23 CT
Goddard voice, Houston COMM TECH NET 1.

00 02 10 27 MSFN
Goddard voice, reading you loud and clear.

Tape 2/6 — Page 14

00 02 10 29 CT
Roger. We cannot raise Tananarive.

00 02 10 31 CT
Houston COMM TECH, Tananarive.

00 02 10 34 CT
Roger, Tananarive. Are you receiving CAP COMM's voice, and are you uplinking it?

00 02 10 39 CT
Negative.

00 02 10 41 CT
Roger. Monitor again and I'll tell CAP COMM to make one more transmission.

00 02 10 51 CT
Roger.

00 02 10 56 CC
Apollo 11, Apollo 11, this is Houston standing by through Tananarive. Over.

00 02 11 04 CDR
Houston, Apollo 11 ...

00 02 11 06 CC
Roger. Reading you loud and clear.

00 02 12 35 CDR
Houston, Apollo 11. We have the PYRO's armed.

00 02 12 39 CC
This is Houston. Roger. Out.

00 02 15 23 CC
Apollo 11, this is Houston. One minute to LOS Tananarive; AOS at Carnarvon 02 25 30.

00 02 15 35 CDR
Roger.

CARNARVON (REV 2)

00 02 25 44 CC

Apollo 11, this is Houston through Carnarvon. Radio check. Over.

00 02 25 49 CDR

Roger, Houston through Carnarvon. Apollo 11. Loud and clear.

00 02 25 53 CC

Roger. You're coming in very loud and very clear, here. Out.

00 02 26 38 CC

Apollo 11, this is Houston. You are GO for TLI. Over.

00 02 26 45 CMP

Apollo 11. Thank you.

00 02 26 48 CC

Roger. Out.

00 02 30 11 CC

Apollo 11, this is Houston. Over.

00 02 30 16 CDR

Houston, 11.

Tape 2/7 — Page 15

00 02 30 18 CC

Roger. We'll be coming within range of the ARIA aircraft coverage, here, in about 1 minute. They're going to try uplinking both on S-band and on VHF this time. So if you turn your - make sure your S-band volume is turned up, we'd appreciate it. And we believe that we'll have continuous coverage from now on through the TLI burn. Over.

00 02 30 42 CDR

Very good.

ARIA (REV 2)

00 02 32 20 CC

Apollo 11, Apollo 11, this is Houston through ARIA 4. Radio check. Over.

00 02 32 28 LMP

Houston, we read you strength 4 and a little scratchy.

00 02 32 34 CC

Roger. We're reading you strength 5, readability about 3. Should be quite adequate.

00 02 32 42 CC

Apollo 11, Apollo 11, this is Houston. We're reading you readability about 3, strength 5. Sounds pretty good. Over.

00 02 32 54 CDR

Roger. We've got a little static in the background now.

00 02 37 21 CC

Apollo 11, this is Houston through ARIA 3. Radio check. Over.

00 02 37 26 CDR

Roger, Houston, Apollo 11. You are much clearer and adequately loud. Over.

00 02 37 32 CC

Roger, 11, You are coming in five-by-five here. Beautiful signal.

00 02 37 38 CDR

This is a lot better than this static we had previously.

00 02 37 41 CC

Okay.

00 02 37 48 CMP

And we got the time base fix indication on time.

00 02 37 50 CC

This is Houston. Roger. Out.

00 02 40 20 CC

Apollo 11, this is Houston. We just got telemetry back down on your booster, and it is looking good.

Tape 2/8 — Page 16

00 02 40 30 CDR

Roger. Everything looks good here.

00 02 40 34 CC

Houston, Roger. Out.

00 02 43 18 CC

Apollo 11, this is Houston. Slightly less than 1 minute to ignition, and everthing is GO.

00 02 43 25 CMP

Roger.

00 02 44 19 CMP

Ignition.

00 02 44 27 CC

We confirm ignition, and the thrust is GO.

00 02 45 14 CC

Apollo 11, this is Houston at 1 minute. Trajectory and guidance look good, and the stage is good. Over.

00 02 45 23 CDR

Apollo 11. Roger.

00 02 46 26 CC

Apollo 11, this is Houston. Thrust is good. Everything's still looking good.

00 02 46 32 CDR

Roger.

00 02 47 54 CC

Apollo 11, this is Houston. Around 3-1/2 minutes. You're still looking good. Your predicted cut-off is right on the nominal.

00 02 48 04 CDR

Roger. Apollo 11 is GO.

00 02 49 18 CC

Apollo 11, this is Houston. You are GO at 5 minutes.

00 02 49 22 CDR

Roger. We're GO.

00 02 50 36 CC

Apollo 11, this is Houston. We show cut-off and we copy the numbers in NOUN 62.

00 02 50 54 CC

Apollo 11, Houston. Do you read?

00 02 51 28 CC

Apollo 11, this is Houston. Do you read? Over.

00 02 51 21 LMP

Roger, Houston. Apollo 11. We're reading a VI of 35579 and the EMS was plus 3.3. Over.

00 02 51 31 CC

Roger. Plus 3.3 on the EMS. And we copy the VI.

00 02 53 03 CDR

Hey, Houston, Apollo 11. That Saturn gave us a magnificent ride.

00 02 53 07 CC

Roger, 11. We'll pass that on. And, it certainly looks like you are well on your way now.

Tape 2/9 — Page 17

00 02 53 30 CDR

We have no complaints with any of the three stages on that ride. It was beautiful.

00 02 53 38 CC

Roger. We copy. No transients at staging of any significance. Over.

00 02 53 44 CDR

That's right. It was all - all a good ride.

00 02 53 47 CC

Houston. Roger. Out.

00 02 54 09 CC

Apollo 11, this is Houston. For your information, we expect the maneuver to separation attitude to begin at 3 plus 05 plus 03, and to be completed at plus 09 plus 20. Separation at 3 plus 15 plus 00.

00 02 54 33 CDR

Roger. Time to begin maneuver is 3 05 03, complete 3 09 20. Separation 3 plus 15 00.

00 02 54 46 CC

Roger. That separation should be 3 plus 15 03. My error in reading up.

00 02 54 55 CDR

Roger.

00 02 55 18 CC

Apollo 11, this is Houston. All the booster functions are proceeding normally. The sequencing is in good shape, and it doesn't look like they are having any problems at all. Over.

00 02 55 28 CDR

Roger.

END OF TAPE

Tape 3/1 — Page 18

00 03 05 28 CC

Apollo 11, this is Houston. Our preliminary data indicates a good cut-off on the S-IVB. We'll have some more trajectory data for you in about half an hour. Over.

00 03 09 01 CC

Apollo 11, Apollo 11, this is Houston. Over.

00 03 09 16 CC

Apollo 11, Apollo 11, this is Houston. Over.

00 03 09 31 CDR

Hello, Houston. Hello, Houston. This is Apollo 11. I'm reading you loud and clear. Go ahead. Over.

00 03 09 37 CC

Roger, 11. This is Houston. We had to shift stations. We weren't reading you through Goldstone. We show PYRO bus A armed and PYRO bus B not armed at the present time. Over.

00 03 09 50 CDR

That's affirmative, Houston. That's affirmative.

00 03 09 54 CC

Roger.

00 03 14 08 CC

Apollo 11, this is Houston. You're GO for separation. Our systems recommendation is arm both PYRO buses. Over.

00 03 14 19 CDR

Okay. PYRO B coming armed. My intent is to use bottle primary 1, as per the checklist; therefore, I just turned A on.

00 03 14 26 CC

Roger. We concur with the logic.

00 03 16 59 CDR

Houston, we're about to SEP.

00 03 17 02 CC

This is Houston. We copy.

00 03 17 09 CDR

SEP is complete.

00 03 17 12 CC

Roger.

00 03 17 32 CDR

... and primary and secondary propellant B went ... SEP.

00 03 17 40 CC

That was secondary propellant on quad Bravo?

00 03 17 45 CDR

Quad Bravo, yes. Both the primary and secondary ...

00 03 17 52 CC

Roger. We copy.

Tape 3/2 — Page 19

00 03 22 07 CC

Apollo 11, this is Houston. Radio check. Over.

00 03 23 56 CC

Apollo 11, Apollo 11, this is Houston broadcasting in the blind. Request OMNI Bravo if you read us. Request OMNI Bravo. Out.

00 03 24 13 CC

Apollo 11, this is Houston. How do you read?

00 03 25 49 CC

Apollo 11, this is Houston. How do you read? Over.

00 03 26 47 CC

Apollo 11, Apollo 11, this is Houston. Do you read? Over.

00 03 27 54 CC

Apollo 11, this is Houston. Radio check. Over.

00 03 28 11 CC

Apollo 11, Apollo 11, this is Houston. Radio check. Over.

00 03 29 20 CC

Apollo 11, this is Houston. Radio check. Over.

00 03 29 24 CDR

Roger. ...

00 03 29 26 CC

Roger. We're copying you about five-by-two, very weak. Can you give us a status report, please?

00 03 29 35 CDR

Roger. We are docked. We do have acquisition with the high gain at this time, I think.

00 03 29 44 CC

Understand you are using the high gain. Over.

00 03 29 48 CDR

That's affirmative.

00 03 29 49 LMP

That's affirmative.

00 03 29 51 CC

Roger. I read you very loud and clear, Buzz. Mike is pretty weak.

00 03 30 00 LMP

Roger. We've got the high gain locked on, now, I believe; AUTO tracking now.

00 03 30 05 CC

Okay. You're coming in loud and clear, but Mike is just barely readable.

00 03 30 12 CMP

That was Neil. How are you reading Mike?

00 03 30 15 CC

Loud and clear now, Mike, and we understand that you are docked.

00 03 30 19 CMP

That's affirmative.

00 03 30 24 CDR

Houston, CDR. How do you read ...?

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00 03 30 28 CC

11, CDR, loud and clear, Neil.

00 03 30 30 CDR

Okay.

00 03 32 40 CC

11, this is Houston. Over.

00 03 32 44 CDR

Houston, Apollo 11. Go ahead.

00 03 32 46 CC

Roger. When you commented on that quad Bravo problem at separation, you were a little weak. Could you go through what you did after you noticed the talkbacks barber pole again, please?

00 03 33 20 CC

We copied the - the primary and secondary propellant talkbacks on SM RCS quad Bravo 1 to barber pole on separation.

00 03 33 30 CDR

Roger. Roger. That is affirmative, and we moved that switch to the OPEN position, and they went back to gray. Over.

00 03 33 39 CC

Roger.

00 03 37 51 CC

Apollo 11, this is Houston. Over.

00 03 37 56 CMP

Roger, Houston. Apollo 11. Go ahead.

00 03 37 58 CC

Roger. Could you give us comments on how the transposition and docking went? Over.

00 03 38 07 CMP

I thought it went pretty well, Houston, although I expect I used more gas than I've been using in the simulator. The turnaround maneuver - I went PITCH ACCEL COMMAND and started to pitch up, and then when I put MANUAL, ATTITUDE PITCH back to RATE COMMAND for some reason it - it stopped its pitch rate, and I had to go back to ACCEL COMMAND and hit what I thought was an extra PROCEED on the DSKY. During the course of that, we drifted slightly further away from the S IVB than I expected. I expected to be out about 66 feet. My guess would be I was around 100 or so; and therefore, I expect I used a bit more coming back in. But, except for using a little more gas - And I'd be interested in your numbers on that - everything went nominally.

00 03 38 53 CC

This is Houston. Roger. We copy.

00 03 43 45 CMP

Houston, Apollo 11. Over.

00 03 43 47 CC

Go ahead, 11.

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00 03 43 50 CMP

Roger. We're working on the pressurization of the LM now, and working off the decal with CSM-LM pressure equalization. And we're down to step 13, where we're waiting for the cabin pressure to be 5, or it should be roughly 5, before we turn the REPRESS package O2 valve to FILL. Instead of 5, we're running about 4.4. Over.

00 03 44 16 CC

Roger. Stand by a second.

00 03 44 55 CMP

And Houston, Apollo 11. We did put the REPRESS package O2 valve to FILL momentarily there at step 13, and we have filled the bottles back up partially. What's the pressure reading in there, Neil?

00 03 45 17 CMP

We have about 450 psi now in the three 1-pound bottles.

00 03 45 23 CC

Roger. Stand by a second, please.

00 03 45 25 CMP

Roger. Standing by. The REPRESS package valve is now in the OFF position. What's the cabin pressure now, Buzz? Cabin pressure is now 4.5.

00 03 47 49 CDR

Houston, Apollo 11. We think these readings are within normal tolerances. We just wanted to get your concurrence before we press down any further with these decals.

00 03 48 01 CC

Okay, Captain.

00 03 48 28 LMP

Houston, Apollo 11. How do you read?

00 03 48 32 CC

Apollo 11, this is Houston. Go ahead.

00 03 48 35 LMP

Roger. LM looks to be in pretty fine shape from about all we can see from here.

00 03 48 43 CC

Okay. In reference to your question on this step 13 on the decal, I understand that you have used up the contents of the REPRESS O2 package and at that time, instead of being up to 5 psi, you were reading 4.4. Is that correct?

00 03 49 07 CMP

Okay. 4.4. Yes sir.

00 03 49 11 CC

Okay. And you want to know if you can go ahead and use additional oxygen to bring the command module up to 5.0 and continue the equalization? Over.

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00 03 49 20 CMP

Yes. We think it's within normal tolerances, Bruce. We just wanted to get your concurrence before we press on with this procedure.

00 03 49 33 CC

Roger, Apollo 11. Go ahead.

00 03 49 37 CMP

Okay. We're pressing on with the procedure.

00 03 49 40 CC

And 11, Houston. We have a request for you. On the service module secondary propellant fuel pressurization valve: As a precautionary measure, we'd like you to momentarily cycle the four switches to the CLOSE position and then release. As you know, we have no TM or talkback on these valve positions, and it's conceivable that one of them might also have been moved into a different position by the shock of separation. Over.

00 03 50 11 CMP

Okay. Good idea. That's being done.

00 03 50 14 CC

Houston. Roger. Out.

00 03 50 29 CC

Apollo 11, Houston. We're doing a nonpropulsive vent on the booster at the present time. You may see some sort of a cloud coming out of it. When you're ready, I have your evasive maneuver PAD.

00 03 50 44 CDR

Roger, And it's coming out.

00 03 50 48 CC

Roger. Out,

00 03 50 50 CDR

It's a haze. It's going by toward our minus-X direction, and several small particles are moving along with it. The actual velocity is fairly high - at least it appears to be high. And we've got an O2 high - it's a little high right now.

00 03 51 13 CC

Houston. Roger. Out.

00 03 53 05 CDR

And, Houston, you, might be interested that out my left-hand window right now, I can observe the entire continent of North America, Alaska, and over the Pole, down to the Yucatan Peninsula, Cuba, northern part of South America, and then I run out of window.

00 03 53 27 CC

Roger, We copy.

00 03 57 12 LMP

Houston, Apollo 11. All 12 latches are locked.

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00 03 57 16 CC

Roger. 11, this is Houston. Understand 12 latches locked.

00 03 59 03 CC

11, Houston. Whenever you're possessed of a free moment there, we've got this evasive maneuver PAD.

00 03 59 12 LMP

Okay.

00 03 59 20 LMP

Go ahead, Houston. Apollo 11 is ready to copy.

00 03 59 24 CC

Apollo 11, this is Houston. Evasive maneuver SPS G&N: 63481, plus 095, minus 020; GETI 004 40 0100, plus 00051, plus all balls, plus 00190; roll is your option, pitch 213 357; NOUN 44 is NA; DELTA-VT is 00197 003 00152. The rest of the PAD is NA. No ullage. LM weight 33,290. Read back. Over.

00 04 01 23 CC

Apollo 11, this is Houston. Standing by for your readback. Over.

00 04 02 06 CC

11, Houston. Do you read? Over.

00 04 02 25 CC

Apollo 11, this is Houston. Do you read? Over.

00 04 02 31 LMP

All of a sudden there, we heard a little click, and the signal strength began to start dropping off. Your transmissions were cut off very abruptly. How do you read now?

00 04 02 42 CC

Roger. Loud and clear. We had a handover to Madrid about the time I was - I guess halfway through the PAD. If you could give me the last value you read, I'll pick up there. Over.

00 04 02 52 LMP

Okay. Start with DELTA-VZ. Over.

00 04 02 56 CC

Roger. DELTA-VZ is plus 00190, roll your option, pitch 213 357, and NOUN 44 is NA. DELTA-VT 00197 003 00152. The rest of the PAD is NA, and no ullage. LM weight 33,290. Read back. Over.

00 04 03 41 LMP

Roger, Houston. Evasive maneuver SPS G&N: 63481, plus 095, minus 020 004 40 0100, plus 00051, plus all zeros, plus 00190, roll crew option, 213 357, NA, 00197 003 00152, no ullage, LM weight 33,290. Over.

00 04 04 27 CC

11, this is Houston. Readback correct. Out.

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00 04 13 33 CDR

Houston, Apollo 11.

00 04 13 36 CC

Go ahead, 11.

00 04 13 37 CDR

We'd like to arm our logic switches.

00 04 13 42 CC

Go ahead with the logic.

00 04 13 45 CDR

Okay. Mark logic 1 and 2 armed.

00 04 13 59 CC

Roger. We show the logic arm, and you're GO for PYR0 arm.

00 04 16 38 CDR

Houston, we're ready for LM ejection.

00 04 16 45 CC

Roger. You're GO for LM ejection.

00 04 16 48 CDR

Thank you.

00 04 17 13 CDR

Houston, we are SEP. We have a CRYO PRESS light.

00 04 17 18 CC

Roger. Copy. CRYO PRESS light.

00 04 17 46 CC

Roger, 11. We recommend you turn the O2 fans on manually and ensure that the O2 heaters are in the AUTOMATIC position.

00 04 17 57 CDR

Roger. O2 heaters are ON, and we're going to cycle the O2 fans now.

00 04 18 02 CC

Roger. O2 heaters to AUTO, or you can watch them in the ON position, and O2 fans manual ON.

00 04 28 16 CC

Apollo 11, this ls Houston. Over.

00 04 28 21 CMP

Houston, Apollo 11.

00 04 28 23 CC

Roger. In reference to your question on RCS usage: it looks like you are about 18, maybe 20 pounds below nominal at the present time. No problem at all. Over.

00 04 28 35 CMP

Right.

00 04 28 45 CMP

I wanted to be 18 or 20 pounds above nominal, babe.

00 04 28 49 CC

Sorry about that.

END OF TAPE

Tape 4/1 — Page 25

00 04 37 40 CC

11, Houston. Your systems are looking good. We're standing by for the burn.

00 04 40 42 CMP

Houston, Apollo 11. Could you confirm that pitch gimbal motor number 1 turned off? We just shut all four off, and we got a questionable indication on the ECS on pitch 1.

00 04 41 01 CC

Roger. Stand by a second.

00 04 41 22 CMP

Houston, did you copy our residuals?

00 04 41 24 CC

Apollo 11, this is Houston. Stand by, please.

00 04 41 33 CMP

Go ahead, Houston. Did you copy our residuals?

00 04 41 37 CC

Roger. We got 00 and 0.2, it looks like.

00 04 41 42 CMP

We had 0.1 while ago. It's - just went to 0.2.

00 04 41 46 CC

Okay.

00 04 41 47 CDR

That EMS DELTA-V counter is minus 4.0.

00 04 41 51 CC

Minus 4.0. Roger.

00 04 41 54 CDR

And how about pitch gimbal 1? Can you confirm that OFF?

00 04 41 57 CC

Can you stand by just a second on that? At the present time we cannot confirm it OFF. We saw a current drop indicating that several gimbal motors had gone off. We'll be back with you in just a second on it. Over.

00 04 42 10 CDR

Okay, If necessary, we can recycle it.

00 04 43 47 CC

Apollo 11, this is Houston. If you'll go ahead and cycle pitch gimbal motor number 1 on and then off and give us a Mark, and we'll tell you what we see. Over.

00 04 43 54 CDR

Okay, fine. It's coming back on. Ready.

00 04 44 01 CDR

MARK.

00 04 44 04 CDR

And it's going back off. Ready.

00 04 44 06 CDR
MARK.

00 04 44 07 CDR
And that time we got an onboard indication, Houston. Thank you a lot.

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00 04 44 12 CC
Roger. We confirm that it is OFF.

00 04 44 16 CDR
Yes. We do likewise.

00 04 45 33 CMP
Houston, Apollo 11. We're starting our maneuver to observe the S IVB slingshot.

00 04 45 39 CC
Roger, 11. We've got an updated attitude for you on the slingshot observation.

00 04 45 45 CMP
Okay. Say the angles please.

00 04 45 48 CC
Roger. Roll 002.5, pitch 289.3, yaw 357.5, and there's also an update - minor correction to your attitude for the P52. Over.

00 04 46 15 CMP
Roger. I have roll 002.5, pitch 289.3, and yaw 357.5. Over.

00 04 46 23 CC
Roger. And for your P52 and optics calibration, it'll be roll 346.5, pitch 345.0, and yaw 007.8. Over.

00 04 46 44 CMP
Roger. 346.5, 345.0, and 007.8. Thank you.

00 04 46 49 CC
Houston. Roger. Out.

00 04 49 33 CC
Apollo 11, this is Houston. Over.

00 04 49 36 CMP
Roger. Go ahead, Houston. Apollo 11.

00 04 49 38 CC
Roger. We're going to go ahead and enable the S IVB for the slingshot maneuver. The LOX dump will start about 12 minutes from now. Over.

00 04 49 49 CMP
Okay, LOX dump about - I guess that'll make it about 01, huh?

00 04 49 57 CC
Right. I'll try to give you a little closer update as we approach it.

00 04 50 01 CMP
Alright.

00 04 50 53 CC

And, 11, for you information, the magnitude of midcourse correction number 1, if we burn, looks like about 17 feet per second. We're presently considering not burning it. This would make midcourse correction 2 tomorrow about 21.3. Over.

00 04 51 18 CDR

That sounds good to us.

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00 04 51 19 CC

Roger. You're looking good down here.

00 04 52 19 CDR

Well, we didn't have much time, Houston, to talk to you about our views out the window when we were preparing for LM ejection; but up to that time, we had the entire northern part of the lighted hemisphere visible including North America, North Atlantic, and Europe and Northern Africa. We could see that the weather was good all - just about everywhere. There was one cyclonic depression in Northern Canada, in the Athabaska - probably east of Athabaska area. Greenland was clear, and it appeared to be we were seeing just the icecap in Greenland. All North Atlantic was pretty good; and Europe and Northern Africa seemed to be clear. Most of the United States was clear. There was a low - looked like a front stretching from the center of the country up across north of the Great Lakes and into Newfoundland.

00 04 53 24 CC

Roger. We copy.

00 04 53 28 CMP

I didn't know what I was looking at, but I sure did like it.

00 04 53 31 CC

Okay. I guess the view must be pretty good from up there. We show you just roughly somewhere around 19,000 miles out now.

00 04 53 43 CMP

I didn't have much outside my window.

00 04 53 49 CC

We'll get you into the PTC one of these days, and you take turns looking.

00 04 57 35 CMP

Houston, Apollo 11. We've completed our maneuver to, observe the slingshot attitude, but we don't see anything - no Earth and no S IVB.

00 04 57 48 CC

Roger. Stand by. In GET I have a LOX dump start time for you. It's supposed to start at 5 plus 03 plus 07, and stop at 5 plus 04 plus 55. Ullage burn starts at 5 plus 37 plus 47, stops at 5 plus 42 plus 27. Over.

00 04 58 26 CMP

Roger. Thank you.

00 05 00 48 CC

11, Houston.

00 05 00 51 CDR

Go ahead, Houston.

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00 05 00 53 CC

Roger. We now recommend the following attitude: roll 307.0, pitch 354.0, yaw 019.5, and the LOX dump has already been enabled, so we can't hold it off any longer.

00 05 01 14 CMP

That's okay. Go ahead. We'll maneuver around to 307, 354, and 19 and a half. Thank you sir.

00 05 01 21 CC

Roger.

00 05 01 42 CC

11, Houston. It doesn't look to us like you'll be able to make it around to this observation attitude in 2 minutes. We recommend that you save the fuel. Over.

00 05 01 54 CMP

Okay, Houston. You got to us just a little late. Our maneuver's already begun, so it's going to cost us about the same amount of fuel to stop it, no matter where we stop it, and we may as well keep going.

00 05 02 04 CC

Roger. Go ahead.

00 05 03 19 CC

11, Houston. LOX dump initiated.

00 05 05 06 CC

11, Houston. LOX dump has been terminated. Over.

00 05 05 10 CMP

Roger.

00 05 05 13 LMP

Roger. We still don't have ...

00 05 05 18 CC

Roger. Out.

00 05 12 58 CC

Apollo 11, this is Houston. Over.

00 05 13 03 CDR

Go ahead.

00 05 13 05 CC

Roger. If you'll give us ACCEPT and stay in P00, we'll set your trunnion bias to zero. And, I have a plan for balancing your oxygen CRYO's. Over.

00 05 13 19 CDR

You got it.

00 05 13 21 CC

Roger.

00 05 13 26 LMP

Houston, Apollo 11. We've got the - what appears to be the S IVB in sight - at - oh, I'd estimate a couple of miles away. It's at our number 5 window and the dump appears to

Tape 4/5 — Page 29

be coming out of two radially opposite directions from the S IVB.

00 05 13 51 CC

Roger. They're continuing with the nonpropulsion vent from the liquid oxygen tank. It would be radially opposite, then. And boosters tell me it's the continuous vent system. They're also dumping a small amount of fuel at this time. We've got about 23-1/2 minutes or so until the APS burn. Over.

00 05 14 25 LMP

Roger.

00 05 14 46 CC

11, Houston. We have a recommended configuration for your CRYO switches to even up the load between oxygen tanks 1 and 2. Over.

00 05 14 55 SC

...

00 05 14 59 CC

Okay. You're coming in very weakly there. We're recommending O2 tank 1 heater OFF, O2 tank 2 heater to AUTO, O2 tanks 1 and 2 fans both OFF, H2 tank 1 heaters to AUTO, and H2 tank 1 heaters to AUTO, and H2 tank 2 heaters to OFF. Over.

00 05 15 33 LMP

Roger. We have that except the last one was H2 fans to OFF. Is that affirmative?

00 05 15 49 CDR

We have - The configuration we have now is - Hydrogen heaters: we got 1 AUTO, 2 OFF. Oxygen heaters: 1 OFF, 2 AUTO. And we have all the fans OFF.

00 05 16 02 CC

This is Houston. Roger. We concur. Out.

00 05 16 13 CC

11, this is Houston. We've completed the trunnion zero bias setting. You can retrieve the computer and go to BLOCK.

00 05 16 23 CDR

Roger that. Thank you.

00 05 19 21 CC

11, this is Houston. With this maneuvering to observe the slingshot, I guess we missed copying your LM/CM DELTA-P reading. Over.

00 05 19 33 CMP

Stand by. We'll give you a ...

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00 05 19 35 CC

Roger.

00 05 19 47 CMP

Right now, reading 0.2, Bruce.

00 05 19 49 CC

Roger. 0.2.

00 05 20 00 CC

Okay, Mike. And could you verify that your waste compartment valve is in VENT, there?

00 05 20 12 CMP

Roger. Waste compartment valve has been in VENT for - oh, I guess, 45 minutes or so.

00 05 20 17 CC

Roger. We copy.

00 05 20 31 CMP

If we're late in answering you, it's because we're munching sandwiches.

00 05 20 36 CC

Roger. I wish I could do the same here.

00 05 20 40 CMP

No. Don't leave the console!

00 05 20 42 CC

Don't worry. I won't.

00 05 20 47 CMP

FLIGHT doesn't like it.

00 05 20 54 CMP

How is FLIGHT today?

00 05 20 58 CC

Oh, he's doing quite well.

00 05 23 41 CDR

Houston, 11.

00 05 23 44 CC

Go ahead, 11.

00 05 23 48 CDR

Down in the control center you might want to join us in wishing Dr. George Mueller a happy birthday.

00 05 23 55 CC

Roger. We are standing by for your birthday greetings.

00 05 24 05 CDR

I think today is also the birthday of California, and I believe they are 200 years old, and we send them a happy birthday. And I think it's Dr. Mueller's birthday, also, and I don't think he is that old.

00 05 24 25 CC

Roger. We copy. I'm looking back in the viewing room right now. I don't see him back there.

00 05 24 33 CDR

He may not be back from the Cape yet.

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00 05 24 43 CC

Roger. I believe Dr. Mueller is on his way back from the Cape. We will relay his greetings for you.

00 05 24 49 CDR

Thank you.

00 05 28 18 CC

11, this is Houston. Over.

00 05 28 22 LMP

Go ahead, Houston.

00 05 28 24 CC

Roger. At your convenience, we would like to get a waste-water dump to 5 percent remaining. After completion of this one, the next wastewater dump will be at about GET equal to 25 hours. Over.

00 05 28 42 CMP

Coming on right now.

00 05 28 44 CC

Roger.

00 05 35 27 CMP

Houston, Apollo 11. Did you copy our torquing angles?

00 05 35 31 CC

Roger. Leave them on there probably a second, please.

00 05 35 34 CMP

Will do.

00 05 36 22 CC

11, this is Houston. We copy the angles, but stand by before you go ahead and use them. Over.

00 05 36 29 CMP

Standing by.

00 05 36 33 CC

11, Houston. We request that you read P52, and if the angles come out the same magnitude, go ahead and incorporate them. Over.

00 05 36 42 CMP

Okay. We'll do that.

00 05 36 44 CC

They look a little large right now.

00 05 36 47 CMP

Yes. Roll - roll locks a little large, especially, there.

00 05 36 50 CC

Roger.

00 05 37 31 CC

We're showing a waste-water quantity of about 13 percent on TM now, 11. Over.

00 05 37 43 CMP

Roger. It's off, now

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00 05 37 45 CC

Roger. We copy.

00 05 39 32 CMP

Houston, Apollo 11. Torquing angles essentially the same, and we're going to go ahead and torque them now.

00 05 39 41 CC

Roger. We concur.

00 05 39 43 CMP

Okay.

00 05 41 35 CC

Apollo 11, this is Houston. Could you give us a - an AUTO optics check to a third star or a different star from the one you've been using?

00 05 41 45 CMP

Sure, be glad to. I can go back and do the whole thing and pick different stars.

00 05 41 52 CC

I don't think there - there's any need to do that. We'd just like to confirm it with a different star, since that roll angle was a little larger than we expected.

00 05 42 03 CMP

Okay.

00 05 43 25 CC

Apollo 11, Houston. I have a TLI-plus-11-hour PAD when you're ready to copy.

00 05 43 33 LMP

Wait one.

00 05 44 17 CMP

Old star number 30 looks like it is right dab smack in the middle of the sextant.

00 05 44 57 CMP

Houston. Roger. Out.

00 05 45 27 LMP

Ready to copy.

00 05 45 31 CC

Roger, 11 This is TLI-plus-11-hours. P37 format: 01344 4793, minus 165 04923. Read back. Over.

00 05 45 57 LMP

Roger. 01344 4793, minus 165 04923. Over.

00 05 46 07 CC

This is, Houston. Readback correct. Out.

00 05 58 35 CDR

Houston, Apollo 11.

00 05 58 38 CC

Go ahead, 11.

00 05 58 40 CDR

Roger. Do you have any update for the roll, pitch and yaw angles on the top of page 37 in the flight plan. Or are they still good?

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00 05 58 48 CC

That's for the optics calibration?

00 05 58 51 CDR

Yes, sir.

00 05 58 53 CC

Yes, indeed. I'll give them to you in just a second here.

00 05 59 18 CC

Roger, 11. For the optics calibration I've got 346.5 for roll, 345.0 for pitch, and 007.8 for yaw. The pen-and-ink attitude corrections in your book for P23 are good. Over.

00 05 59 50 CDR

Okay. Thank you.

00 05 59 55 CC

And we're going to hand over to Hawaii in about 5 or 6 seconds, here. We'll have a momentary COMM dropout.

00 06 00 02 CDR

Roger.

00 06 09 17 CC

Hello, Apollo 11. Houston. Be advised your friendly White Team has come on for its first shift, and if we can be of service, don't hesitate to call.

END OF TAPE

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00 06 09 31 CMP

Thank you very much. And we're about to take our marks, Charlie, on this P23 optics CAL. I've got it in the sextant now, and I'm about to split the image and Mark.

00 06 09 42 CC

Roger, Mike. We're watching.

00 06 19 23 CC

Hello, Apollo 11. Houston. We have scrubbed the midcourse 1. Over.

00 06 19 30 CMP

Roger. Understand you've scrubbed midcourse 1.

00 06 19 33 CC

Roger.

00 06 21 39 CC

Hello, Apollo 11. Houston. We see your middle gimbal angle getting pretty big. Over.

00 06 21 45 CMP

Well, it was, Charlie, but in going from one AUTO maneuver to another, we took over control and have gone around gimbal lock; and we're about to give control back to the DAP.

00 06 21 56 CC

Roger, Mike. We see it increasing now.

00 06 25 25 LMP

Hey Charlie.

00 06 25 45 LMP

Houston, Apollo 11.

00 06 25 46 CC

Go ahead, 11. Over.

00 06 25 47 LMP

Hey, maybe you better call Lou and tell him we might be a little bit late for dinner.

00 06 25 51 CC

Okay. Sure will. We'd like for you to turn on - the fan on in O2 tank number 2, Buzz. And, 11, did you - on your optics calibrations, did you proceed or recall the program? Over.

00 06 26 08 LMP

We recalled the program.

00 06 26 12 CC

Roger.

00 06 26 13 LMP

And O2 fan number 2 is on.

00 06 26 15 CC

Roger.

00 06 26 42 LMP

Houston, Apollo 11. I've got a CRYO pressure light and a MASTER ALARM. It's reset.

00 06 26 51 CC

Roger. We expected that. That's why we had you turn the fan on. We were getting pretty

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close to the caution and warning limits. We were trying to prevent that.

00 06 27 00 LMP

Okay.

00 06 34 30 CMP

Houston, Apollo 11.

00 06 34 36 CC

Go ahead, 11. Over.

00 06 34 39 CMP

Roger. You're looking at our DELTA-R DELTA-V. It looks like DELTA-R is pretty large, there. We wanted to talk to you about it before we incorporate it.

00 06 34 44 CC

Stand by, Mike. We don't have anything on our downlink here, I don't think, on the DSKY. Stand by.

00 06 34 50 CMP

Okay. Our NOUN 49 is reading: register 1, plus 08793; register 2, all balls.

00 06 35 01 CC

Copy.

00 06 36 15 CC

11, Houston. Guidance is looking at the NOUN 40 - 49 stuff. We'll be back with you momentarily. Over.

00 06 36 23 CMP

Okay, Charlie. Thank you. We'll just hold right here in the program.

00 06 36 26 CC

Roger. We got the downlink now. Over.

00 06 36 27 CMP

Okay.

00 06 36 57 CC

Hello, Apollo 11. Houston. We'd like you to reject the NOUN 49 stuff on the DSKY right now, Mike, and try it again. Over.

00 06 37 01 CMP

Okay. Will do.

00 06 38 46 CMP

Okay, Houston. Apollo 11. Here's another 49 for you. Are you getting it on the downlink?

00 06 38 51 CC

Roger. We see it. Stand by.

00 06 40 22 CC

Hello, Apollo 11. Houston. We recommend you accept the NOUN 49 display on the DSKY now. Over.

00 06 40 34 CMP

Okay. It looks like an awful big one. We noticed that you'd moved star number 2 to the

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tail end of the listing, and we should be marking first on star 40. Did that have anything to do with it?

00 06 40 47 CC

Negative. We don't believe so, Apollo 11. We think that this is possibly due to some TLI dispersions, and it's probably satisfactory. So go ahead and accept this. It fits our criteria anyway that if you repeat the mark and you get an equivalent size to go ahead and accept it. And this is an equivalent size error. Over.

00 06 41 09 CMP

Okay. We'll do it.

00 06 41 14 CC

And 11, Houston. Your state vector in the LM slots are - is good. Over.

00 06 41 22 CMP

Roger. Thank you.

00 06 42 55 CMP

Houston, Apollo 11. If you like this, we'll accept it as well.

00 06 43 00 CC

Stand by.

00 06 43 46 CC

Hello, Apollo 11. Houston. We recommend you accept the NOUN 49. Over.

00 06 43 51 CMP

Okay, Charlie. Thank you. We'll do that now.

00 06 43 53 CC

Thank you.

00 06 44 39 CMP

And we're going to proceed on this one, too, Charlie.

00 06 44 41 CC

Roger. Copy.

00 06 48 35 CMP

Houston, Apollo 11. Another NOUN 49 for you.

00 06 48 40 CC

Roger. We copy. Stand by.

00 06 49 00 CC

Hello, Apollo 11. Houston. We'd like you to recycle and do this one over again. Over.

00 06 49 07 CMP

Okay.

00 06 53 41 LMP

Houston, Apollo 11.

00 06 53 43 CC

Go ahead, Apollo 11. Over.

00 06 53 45 LMP

Roger. Why don't you sing out when you think we've done enough battery charging on B.

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00 06 53 50 CC

Roger. Stand by, Buzz. Over.

00 06 55 50 CC

Hello, Apollo 11. Houston. We'll be charging battery B up until the sleep period. We'll discontinue charging at that time. Also, at about 12 25 in the flight plan, we have battery A charge. That has been deleted. Over.

00 06 56 05 LMP

Roger. Understand. We'll charge until the sleep period on B and delete the battery A charge.

00 06 56 10 CC

Affirmative.

00 06 56 17 CMP

And, Houston, Apollo 11. These AUTO optics maneuvers or P23's, AUTO maneuvers, don't seem to be going to the substellar point. Can you come up with the roll, pitch, and yaw angle for the substellar point on this star? It's our second star.

00 06 56 31 CC

Roger. Stand by.

00 06 57 21 CC

Hello, Apollo 11. Houston. Your angles in the flight plan we feel are still good, 198.6 130.7, 340.0. Just slightly off than those in the flight plan. Over.

00 06 57 36 CMP

Okay. We'll try that.

00 06 58 28 CMP

Charlie, state those three angles one more time. I'd like to confirm them before I maneuver.

00 06 58 32 CC

Roger. Roll and pitch are slightly off than what's in the flight plan, 11. Roll is now 198.6, pitch is 130.7. Over.

00 06 58 47 CMP

Roger. Roll 198.6, pitch 130.7, and yaw 340.0.

00 06 58 55 CC

That's affirmative.

00 07 03 32 CMP

Houston, Apollo 11. I think the problem here is that that attitude just is not too close to the substellar point. I'm having to maneuver quite a bit; and that's in progress now, so stand by for some marks.

00 07 03 45 CC

Roger. We copy it all.

00 07 09 24 CC

Hello, Apollo 11. Houston. We've run the angles given in the flight plan for the P23

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attitude through the machines down here, and they come up the same thing every time. We think everything's going correctly, Mike, and we're wondering if the nonsymmetrical horizon might be giving a problem. Over.

00 07 09 51 CMP

Yes, I'd say - It could be, Charlie. Stand by here. We'll get another mark for you.

00 07 09 55 CC

Okay.

00 07 10 30 CMP

Houston, Apollo 11. NOUN 49 for you.

00 07 10 34 CC

Roger. Copy.

00 07 10 41 CC

Stand by.

00 07 11 05 CC

Hello, Apollo 11. Houston. We recommend you accept the NOUN 49. Continue through your sequence of sightings, and then we'll analyze the data afterwards. Over.

00 07 11 15 CMP

Okay.

00 07 20 56 CMP

Houston, Apollo 11. Star 40 has just disappeared now in the sextant. Could the trunnion angle 47 - something be a little high?

00 07 21 05 CC

Stand by.

00 07 21 21 CC

Hello, Apollo 11. Houston. We'd like you to press on to star 44. Over.

00 07 21 26 CMP

Yes. Roger. All right. How many marks have you recorded on star 40?

00 07 21 29 CC

Stand by, Mike.

00 07 21 32 CMP

Okay.

00 07 21 45 CC

11, Houston. We copied two good marks. Over.

00 07 21 49 CMP

Okay.

00 07 33 00 CMP

Houston, Apollo 11.

00 07 33 01 CC

Go ahead. Over.

00 07 33 03 CMP

Roger. Forty-four is just not bright enough for this. There's a reddish glow filling the black area of the sextant, and the star is lost somewhere in there, and I cannot see it.

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00 07 33 17 CC

Roger. Stand by. We'll come up with another star. Over.

00 07 33 21 CMP

Yes. I'd appreciate that.

00 07 33 48 CC

Hello, Apollo 11. Houston. We'd like you to go on to star 45. Over.

00 07 33 53 CMP

Okay.

00 07 33 54 CC

And, Mike, we think these large DELTA-R's, NOUN 49, you're getting is really meaningful since it's been way before TLI since we had a state vector update; and we think it's normal. Over.

00 07 34 09 CMP

Okay. Could be, Charlie. Some of the early markings, I might not have had precisely the substellar point. I think as time goes by they've been coming more accurate but old Enif here is just flat invisible.

00 07 34 21 CC

Roger.

00 07 34 49 CMP

And, Houston, Apollo 11. Understand that the same three gimbal angles you gave me should be valid for star 45 as well. Is that affirmative?

00 07 34 58 CC

I'm believe that's right. Stand by one. Over.

00 07 35 00 CMP

Okay.

00 07 35 03 CC

That is negative. Stand by one.

00 07 35 04 CMP

Okay. Because there's quite a difference between the gimbal angles you have and the gimbal angles the program wants, but with inaccurate state vector, I'm inclined not to believe the program.

00 07 35 16 CC

Stand by.

00 07 35 31 LMP

Houston, Apollo 11. LMP is back on the line.

00 07 35 36 CC

Roger. Copy.

00 07 35 40 LMP

Read you five-by.

00 07 35 42 CC

Roger. Same, Buzz. And, 11, the angles for you are 1978 for roll, 1285 pitch, 3400 yaw.

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00 07 35 58 CMP

Okay. Just as a matter of comparison, P23 for this star would like to go to 235.66, 154.31, and 31365. Over.

00 07 36 15 CC

Roger. We copy, 11. We understand that the program can give you almost an infinite combination of angles in P23, and it's not too unreasonable. If you'll stand by, we'll look at these that we see on the DSKY. Over.

00 07 36 31 CMP

Okay. Then in the meantime I'll just go ahead and maneuver to yours. 197.8, 128.5, and 340.0.

00 07 36 38 CC

Roger.

00 07 43 24 CMP

Houston, Apollo 11.

00 07 43 26 CC

Go ahead. Over.

00 07 43 28 CMP

Okay, Charlie. If the attitude you gave me on star number 45 - The reticle is off, I'd say, a good 30 degrees in roll, and the star is not in sight. Over.

00 07 43 44 CC

Roger. Stand by.

00 07 43 47 CMP

I think something's wrong with those attitudes.

END OF TAPE

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00 07 45 14 CC

Hello, Apollo 11. Houston. I wondered if you have AUTO optics selected. Over.

00 07 45 21 CMP

That's affirmative.

00 07 45 26 CC

Roger. Looks like to us we need a PROCEED, Mike, to get the sextant pointed at the star. Over.

00 07 45 35 CMP

Okay. Stand by.

00 07 46 30 CC

11, Houston. Those shaft and trunnion angles were exactly what we were computing on the ground. Over.

00 07 46 45 CMP

Okay. I'm going to trim up the attitude here and give it another try.

00 07 47 55 CMP

Okay. I have this star loud and clear now, Charlie, so I might as well do a bunch of marks on this one to get a good horizon count.

00 07 48 03 CC

Roger. Stand by.

00 07 48 10 CMP

It still looks like I'm far from the substellar point. However, I'm off quite a bit in roll.

00 07 48 18 CC

Roger. We'd like you to mark right where it is now, Mike, and we'd like two sets of marks on this. Over.

00 07 48 28 CMP

Okay. Fine. But the reticle is not parallel to the horizon. I'd have to move off quite a bit in order to get it parallel to that.

00 07 48 40 CC

Apollo 11, Houston. Our procedures guys are saying that the reticle does not have to be parallel. Over.

00 07 48 51 CMP

Well, then we're not at the substellar point if we're not.

00 07 48 54 CC

Roger.

00 07 51 39 CMP

Houston, you copy that NOUN 49?

00 07 51 41 CC

Roger. We see it, 11. Stand by.

00 07 52 09 CC

Apollo 11, Houston. We would like you to accept this one and every mark thereafter. Over.

00 07 52 16 CMP

Okay.

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00 07 52 55 CMP

Do you need me to wait in the NOUN 49 display for any length of time?

00 07 53 01 CC

Negative.

00 07 53 01 CMP

Okay.

00 07 54 29 CMP

Okay, Charlie. I'll be glad to give you as many of these as you like.

00 07 54 34 CC

Roger. We'd like six marks on star 45, Mike, and then we'll probably go back to star 2 again. Stand by. We'll have further word on that.

00 07 54 43 CMP

Okay.

00 07 55 20 CMP

They seem to be getting smaller, Charlie. Are you sure you wouldn't like some more?

00 07 55 23 CC

Stand by, Mike.

00 07 55 28 CMP

It's no trouble.

00 07 55 31 CC

Roger. Stand by. Out.

00 07 56 07 CC

Apollo 11, Houston. We'd like you to do two more on star 45. Over.

00 07 56 14 CMP

Okay.

00 07 58 02 CMP

Okay, Charlie. There's your two more marks. Where do you want to go from here?

00 07 58 06 CC

Stand by.

00 07 58 21 CC

Hello, Apollo 11, Houston. We'd like you to go back to star number 2 with an attitude as follows: roll 1952, pitch 1239, yaw 3400. Mike, that'll give you a trunnion angle of about 31.4. Over.

00 07 58 45 CMP

Okay. I understand star number 2 and roll 195.2, itch 123.9, and yaw 340.0. Over.

00 07 58 57 CC

That's affirmative.

00 07 59 01 CMP

Okay.

00 08 02 07 CMP

Okay, Charlie. I'm there, and I've got a trunnion angle of 30.5 degrees. Again, misaligned considerably in roll and I do believe that's important to getting good marks.

00 08 02 20 CC

Stand by.

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00 08 02 40 CMP

See, if my reticle's not parallel, then I'm not marking normal to the horizon and I'm not marking at the substellar point. I'm marking off somewhere else.

00 08 02 50 CC

Stand by one. Over.

00 08 02 52 CMP

Okay.

00 08 03 24 CC

Apollo 11, Houston. The ground-computed values for your shaft and trunnion are just what you're getting on the DSKY there, Mike. The horizon looks cocked off to you - You look like you're off in roll because the angles that we gave you to maneuver to, to prevent LM reflection from fouling up your optics, we feel like a - You should go ahead and mark on the stars just as is. Over.

00 08 03 53 CMP

Okay.

00 08 04 08 CMP

I'll bet you a cup of coffee on it.

00 08 04 14 CC

Copy.

00 08 05 08 CMP

VERB - NOUN 49 for you, Charlie.

00 08 05 13 CC

Roger. Stand by.

00 08 05 45 CC

Apollo 11, Houston. We'd like to accept this one and give us two more and that will be enough. Over.

00 08 05 52 CMP

Okay.

00 08 08 25 CC

Apollo 11, Houston. We see your termination on P23. Thank you very much. Mike, we'll have a - We're trying to work up a story here for you; we'll be with you momentarily on an explanation of what's happening. Over.

00 08 08 38 CMP

Okay, Charlie. It just appears to me that you have to have a reticle tangent to the horizon at the point at which you mark or else you're not at the substellar point; you're off laterally, and therefore you're measuring a larger trunnion angle than you should.

00 08 08 56 CC

Seems so to me. Our procedures people are working on this, and we'll be back with you momentarily. Over.

00 08 09 03 CMP

Thank you, sir.

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00 08 11 00 CC

Hello, Apollo 11. Houston. We'd like you to go P00 in ACCEPT. We'll have a PTC REFSMMAT for you momentarily. Over.

00 08 11 13 CMP

Roger. Going P00 in ACCEPT.

00 08 13 55 CC

Hello, Apollo 11. Houston. We're through with the load. You can go back to BLOCK.

00 08 14 02 CMP

You're BLOCK. Thank you.

00 08 24 44 CC

Hello, Apollo 11. Houston. We'd like you to do a P52, option 1 preferred, and establish PTC as listed in the flight plan at 12 hours. We'd like you to commence that right now, Mike. And we have some stars recommended for you. For stars 26, 30, and 24, when you get to attitude 000. Over.

00 08 25 19 CDR

Okay, Charlie. He's off the wick right now. Understand you're ready for us to do a P52, option 1?

00 08 25 31 CC

11, it's a P52, option 1 preferred. Over.

00 08 25 36 CDR

Roger. And, let's see, that is Spica, Menkent, and what else?

00 08 25 43 CC

Roger. Stars - Codes are stars 26, 30, and 24. Over.

00 08 25 49 CDR

24. Okay.

00 08 35 42 CC

Hello, Apollo 11. Houston. We notice your PROGRAM ALARM, Mike, was due to using these stars in the P23 attitude. If you'll go to 000, the stars we gave you will work. Over.

00 08 36 02 CMP

Okay. Understand.

00 08 41 19 CC

Hello, Apollo 11. Houston. Prior to you starting your P52, we'd like to give you a new CSM state vector. Over.

00 08 41 29 CDR

Roger. Wait till we finish the maneuver and we'll give you the DSKY.

00 08 41 37 CC

Roger. We're standing by.

00 08 53 07 CMP

Houston, Apollo 11. The DSKY is yours.

00 08 53 12 CC

Apollo 11, Houston. Go ahead. Over.

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00 08 53 15 CMP

Roger. The DSKY is yours.

00 08 53 29 CC

Roger. Stand by.

00 09 00 59 CC

Hello, Apollo 11. Houston. You can do the VERB 66. The computer is yours, and then the P52, option 1 preferred. Over.

00 09 01 06 CMP

Roger.

00 09 16 10 CC

Hello, Apollo 11. Houston. Do you read? Over.

00 09 18 11 CC

Hello, Apollo 11. Houston. If you read, this attitude 000 is pretty bad for our COMM. In fact, we've lost all data with you, and unreadable on the voice. We recommend you do the P52, option 1 preferred ...

00 09 18 25 CMP

... not a very good attitude at all for COMM, and as soon as we finish our alignment, we'll maneuver it to a different attitude. Over.

00 09 18 34 CC

Roger, 11. We copy. Recommend you go to this P52, option 1 preferred, and then go to PTC attitude. Over. Then we'll get some COMM. When you get there to PTC attitude, it'll be pitch 90, yaw 0 on the high gain. Over.

END OF TAPE

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00 09 21 17 CMP
Houston, Apollo 11. Over.

00 09 21 19 CC
Roger, 11. You're about one-by. Go ahead.

00 09 21 38 CC
Apollo 11, Houston. You're about one-by. Go ahead. Over.

00 09 22 40 CMP
Houston, Apollo 11. Over.

00 09 22 43 CC
Roger, 11. Read you about four-by. How me? Over.

00 09 22 46 CMP
You're loud and clear, Charlie. We pitched down some to get a better COMM attitude.

00 09 22 51 CC
Roger. Did you copy our recommendation on proceeding with the P52, Mike? Over.

00 09 22 58 CMP
Negative. We didn't. I've got that in work. I'm starting on P52.

00 09 23 01 CC
Roger.

00 09 35 56 CMP
Houston, Apollo 11.

00 09 35 59 CC
Go ahead, 11. Over.

00 09 36 01 CMP
Roger. Copy our torquing angles. We're about to torque them.

00 09 36 05 CC
Roger. Stand by.

00 09 36 08 CMP
Roger. The reason for delay, Charlie, is that - difficult to find two stars that are not occulted by the LM and also are not in the midst of a manmade star field up here with dumps.

00 09 36 21 CC
Roger. We copy.

00 09 36 38 CC
Hello, Apollo 11. Houston. You can torque the NOUN 93. Over.

00 09 36 44 CMP
Okay.

00 09 40 34 CMP
Okay, Houston. That completes the P52. We verified the third star with Antares, and AUTO optics are pointing at it pretty closely. How do our platform drift angles look so far, Charlie?

00 09 40 46 CC
Stand by.

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00 09 40 56 CC

Hello, Apollo 11. Houston. We didn't have a chance to get a good check for you. We're going to run a drift check from this alignment until the next one, approximately 12 hours, and we'll have something for you later. Over.

00 09 41 07 CMP

Okay.

00 09 41 46 CC

Hello, Apollo 11. Houston. We'd like you to establish your PTC. We recommend you select quads Alfa and Delta. Over.

00 09 42 14 CDR

Roger. Understand. Alfa and Delta quads.

00 09 42 19 CC

That's affirmative.

00 09 52 53 CC

Hello, Apollo 11. Houston. Would you verify that the ATTITUDE SET switch is in GDC? Over.

00 09 53 06 CDR

The SET switch. Stand by one, Charlie.

00 09 53 09 CC

Roger.

00 09 53 11 CDR

It is now.

00 09 53 14 CC

Roger. It was on IMU.

00 09 53 17 CDR

That's affirmative.

00 09 53 19 CC

Roger. Thank you.

00 10 03 29 LMP

Houston, Apollo 11. How many miles out do you have us now?

00 10 03 34 CC

We have you - Stand by, Buzz. Roughly about 50,000. Stand by.

00 10 03 41 LMP

It's a beautiful sight.

00 10 03 46 CDR

Charlie, on that PTC, we're just waiting our 20 minutes here for all thruster activity to damp out. You might let us know how that's coming.

00 10 03 54 CC

Roger. Will do. We have you about 48,000 miles now.

00 10 03 58 LMP

Thank you.

00 10 05 33 LMP

Houston, Apollo 11. We still have our oxygen fan on for tank 2. Is that what you want?

00 10 05 40 CC

Stand by.

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00 10 05 45 LMP

Hey, Charlie, I can see the snow on the mountains out in California, and it looks like LA doesn't have much of a smog problem today.

00 10 05 57 CC

Roger, Buzz. Copy. Looks like there's a good view out there then.

00 10 06 00 CC

And, Apollo 11, Houston. We'd like you to keep the O2 fan on. It will give you an ECS configuration prior to sleep. Over.

00 10 06 14 LMP

Okay. Thanks.

00 10 06 46 LMP

Charlie, with the monocular, I can discern a definite green cast to the San Fernando Valley.

00 10 06 56 CC

Roger.

00 10 07 00 CC

How's Baja California look, Buzz?

00 10 07 07 LMP

Well, it's got some clouds up and down it, and there's a pretty good circulation system a couple of hundred miles off the west coast of California.

00 10 07 21 CC

Roger. 11, we'd like you to close the waste storage vent valve right now.

00 10 07 28 CMP

Okay.

00 10 07 49 CMP

Waste storage vent valves closed.

00 10 07 51 CC

Copy.

00 10 08 51 CC

Hello, Apollo 11. Houston. We'd like - The rates are looking pretty good right now on the PTC, but we'd like you to continue holding. Over.

00 10 09 01 CMP

Okay. Fine.

00 10 20 28 CC

Hello, Apollo 11. Houston. Your rates look really great, now. You can start your PTC.

00 10 20 33 CMP

Okay. Thanks, Charlie.

00 10 21 51 CDR

Houston, you read 11?

00 10 21 53 CC
Roger. Go ahead, 11. Over.

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00 10 21 56 CDR
Roger. If you'd like to delay PTC after - for 10 minutes or so, we can shoot you some TV of a seven-eights earth. That's - We'll leave that up to you,

00 10 22 12 CC
Roger. Stand by.

00 10 22 50 CC
Hello, Apollo 11. Houston. We'll have our answer for you on the TV in about 1 minute. Over.

00 10 25 56 CC
Apollo 11, Houston. We're ready at Goldstone for the TV. It'll be recorded at Goldstone and then replayed back over here, Neil, any time you want to turn her on, we're ready. Over.

00 10 26 14 CDR
Okay. It'll take us about 5 minutes to get rigged.

00 10 26 16 CC
Roger.

00 10 26 31 CC
Apollo 11, Houston. Could you verify the reading on your O2 flow indicator? Over.

00 10 26 45 LMP
We're still on 0.2. We just inadvertently touched the RAPID REPRESS button. That made a temporary glitch in the flow.

00 10 26 55 CC
Roger. During that glitch there, did it go almost a peg high? Over.

00 10 27 05 LMP
I'd believe that.

00 10 27 14 CC
Apollo 11, Houston. Could you tell us if the O2 flow indicator was pegged high prior to closing the waste storage vent valve? Over.

00 10 27 26 LMP
No, it was not.

00 10 27 29 CC
Roger. Thank you.

00 10 30 59 CC
Hello, Apollo 11. Houston. While ago we tracked into the scan limits and disabled the AUTO drive on the high gain. We'd like you to position the antenna at pitch 30, yaw 270, go to REACQ and that will give us narrow beamwidth. Over.

00 10 31 27 CDR
That yaw 270 and pitch 3 - What was the pitch?

00 10 31 32 CC
Pitch 30, Neil.

00 10 31 35 CDR
Okay. I think we've got you.

Tape 7/5 — Page 50

00 10 31 44 CC

Roger. We've got a good signal there. Thank you much.

00 10 32 24 CDR

Okay, Houston. We are sending picture of Earth down right now, so you can - Let us know if they're receiving at Goldstone.

00 10 32 36 CC

Roger, 11. Goldstone is receiving the TV. Stand by. We'll let you know on the quality. Over.

00 10 33 34 CC

Hello, Apollo 11. Houston. Goldstone says that the TV looks great. Over.

00 10 33 44 CDR

Roger. We're zooming in on the Earth now.

00 10 33 54 CC

Hello, Apollo 11. Houston. Did you copy? Over.

00 10 34 00 CDR

Roger. We copied, Charlie.

00 10 34 04 CC

Roger. Your transmissions the last couple of times have been about two-by. Over.

00 10 34 10 CDR

Okay. How do you read me now?

00 10 34 11 CC

Roger. You're five-by now.

00 10 34 12 CDR

Okay. We're zooming the lens on in until it will just about fill the monitor.

00 10 34 20 CC

Roger.

00 10 34 35 CDR

Okay. It's in full zoom, now.

00 10 34 40 CC

Copy, 11.

00 10 34 43 CDR

And how about the f-stop? Is 22 going to be accurate?

00 10 34 49 CC

Stand by. We'll get with the Goldstone TV guy. We don't have anything here at Houston. Stand by.

00 10 34 55 CDR

It looks good on the monitor, as far as the f-stop goes. Therefore, we just assumed it's okay at Goldstone.

00 10 35 26 CC

Hello, Apollo 11. Houston. Goldstone says it - TV looks really great, five-by; we don't - The AGC looks like it's working fine. The f:22 is good; we have no real white spots. They're real pleased with it. Over.

Tape 7/6 — Page 51

00 10 35 42 CDR

Okay. You just cut out, Charlie. We understand that it's looking great. We'll leave it the way it is and wait for you to come back on.

00 10 35 51 CC

Roger. How do you read me now? Over.

00 10 35 54 CDR

Five-by.

00 10 35 55 CC

Okay. My comments were - My comments were from Goldstone that they see no white spots as we saw in 10. Looks like the AGC's working real well. The f:22 looks good. Over.

00 10 36 08 CDR

Okay. Very good. Well, we shut out the Sun coming in from the other windows into the spacecraft, so it's looking through a - the number 1 window, and there isn't any reflected light now. So, it ought to be a pretty good picture.

00 10 36 24 CC

Roger.

00 10 37 05 CC

Hello, Apollo 11. Houston. We'd like you to keep the TV on for about 10 minutes or so, so we can get some good comparison on the camera. You can do anything your heart desires on the TV: interior, exterior, pan in and out, anything you'd like. Over.

00 10 37 46 CC

11, Houston. Over.

00 10 38 05 CMP

Houston, Apollo 11. Over.

00 10 38 06 CC

Roger. Go ahead. Over.

00 10 38 09 CMP

Charlie, I'm sorry; you keep cutting out. We heard up to "you can do anything," and then after that we didn't hear anything, and we knew that wasn't right anyhow because we can't. But what do you want us to do?

00 10 38 21 CC

Roger. We'll check this uplink on our voice. That transmission on the TV was - We'd like to get about 10 minutes worth of signal at Goldstone so we can look at the camera quality back here at Houston for about 10 minutes or so when they patch it back into us. What we were saying was that you can go interior or exterior on the camera. On the exterior shots, we'd like to look - -

00 10 38 47 CMP

You cut out again.

Tape 7/7 — Page 52

00 10 38 48 CC

Stand by.

00 10 38 55 CMP

Start over with, "we were saying."

00 10 39 36 CMP

Okay, Houston. You suppose you could turn the Earth a little bit so we can get a little bit more than just water?

00 10 39 45 CC

Roger, 11. I don't think we got much control over that. Looks like you'll have to settle for the water.

00 10 40 01 CC

11, Houston. We're going to change - thinking about changing our voice uplink to another site. If you'll stand by, we'll see if we can improve the quality. Over.

00 10 40 11 CMP

Okay, Charlie.

00 10 40 12 CDR

We'll stand by for your call.

00 10 40 48 CC

Apollo 11, Houston. We'll try once more on this TV request. We'd like 10 minutes worth of TV. And we'd like a narrative, if you could give us one, on the exterior shots. You could also - we also suggest you might try the - an interior position. Over.

00 10 41 10 CDR

Roger. We're seeing the center of the Earth as viewed from the spacecraft in the eastern Pacific Ocean. We have not been able to visually pick up the Hawaiian Island chain, but we can clearly see the western coast of North America. The United States, the San Joaquin Valley, the High Sierras, Baja California, and Mexico down as far as Acapulco, and the Yucatan Peninsula; and you can see on through Central America to the northern coast of South America, Venezuela, and Colombia. I'm not sure you'll be able to see all that on your screen down there ...

00 10 42 04 CC

Roger, Neil. We just wanted a narrative such that we can - When we get the playback, we can sort of correlate what we're seeing. Thank you very much.

00 10 42 19 CMP

I haven't seen anything but the DSKY so far.

00 10 42 23 CC

Looks like they're hogging the window.

00 10 42 29 CDR

You're right.

Tape 7/8 — Page 53

00 10 46 58 CC

Hello, Apollo 11. Houston. On your CRYO's, we'd like at this time for you to place all four CRYO heaters to AUTO and turn off all four CRYO fans. Over.

00 10 47 15 LMP

Okay. All four CRYO heaters are AUTO. And all four CRYO fans are off

00 10 47 25 CC

Roger. That's going to be your sleep configuration.

00 10 47 29 LMP

Okay.

00 10 47 30 CC

And, Buzz, we'll be terminating the battery charge in about a half hour.

00 10 47 35 LMP

Roger.

00 10 47 58 CC

Hello, Apollo 11. Houston. You can terminate the TV at your convenience. We've got enough take. And you can start PTC at your convenience. The rates look super for starting up. Over.

00 10 48 14 CDR

Roger, Charlie

END OF TAPE

Tape 8/1 — Page 54

00 10 57 32 CC

Apollo 11, Houston. We have a flight plan update for you and some P37 block data, if you're ready to copy. Over.

00 10 57 41 CDR

Stand by.

00 10 58 19 CDR

Okay, Houston. PTC is started now; looks good to us, and we'll be ready to copy in a minute or two.

00 10 58 24 CC

Roger. Copy, 11.

00 10 58 59 LMP

Houston, Apollo 11. Ready to copy the flight plan update and P37.

00 10 59 04 CC

Roger. Stand by one, Buzz.

00 10 59 21 CC

Apollo 11, Houston. Coming at you with the P37 block data. Over.

00 10 59 28 LMP

Okay.

00 10 59 29 CC

Roger. 027 44 5363, minus 165 073 14 037 44 8016, minus 165 072 46; GETI 046 44 6141, minus 165 097 03 055 44 8209, minus 165 096 42. Ready for your readback. Over.

00 11 01 01 LMP

Roger. 027 44 5363, minus 165 073 14 037 44 8016, minus 165 072 46 046 44 6141, minus 165 097 03 055 44 8209, minus 165 096 42. Over.

00 11 01 34 CC

Roger, 11. That was a good readback. That was the block data scheduled for 12 hours. We'd like to just say that on a flight plan update here, just to remind you of some things, and you can do them at your convenience and then go to sleep early if you'd like. We don't have anything else planned, but we'd like to just remind you on the filter change, the O2 fuel cell purge. And we'd like a LM/CM DELTA-P and accomplish the presleep checklist.

00 11 02 34 CDR

Okay. We've completed the filter change, and we'll get started on the fuel cell purge, and stand by for the LM/CM DELTA-P.

00 11 02 42 CC

Roger, 11. Would you hold off on the fuel cell purge? EECOMM is saying we might not have to do that. Over.

00 11 02 51 CDR

Okay.

Tape 8/2 — Page 55

00 11 03 05 CMP

Charlie, the LM/CM DELTA-P is 0.5.

00 11 03 17 CC

Copy. 0.5. Out.

00 11 03 10 CC

Hello, Apollo 11. Houston. We've just decided to delete the O2 fuel cell purge. Over.

00 11 03 56 CDR

Roger. Delete the O2 fuel cell purge.

00 11 06 21 CC

Hello, Apollo 11. Houston. We've been noting some funnies on the O2 flow indicator transducer. We've kind of got a suspicion that the transducer - We expected to see an O2 flow pegged high with the waste stowage vent to VENT. It was not. We also noted some funny indications when you closed the waste stowage vent valve. We're going to continue to take a look at this through the night, and we'll be with you in the morning with an assessment of the problem. Also, we'd like to ask specifically, when you place the waste stowage vent valve to VENT, does the detent - correction - Does the arrow line up with the detent? Over.

00 11 07 18 CMP

Stand by one, Charlie. We'll give you something on the detent.

00 11 07 21 CC

Roger.

00 11 07 28 CMP

Right now it's at CLOSED, and I lined up with CLOSED before I was at VENT; and best I can recall, it was quite accurately lined up with VENT. Would you like me to go to VENT again momentarily and see where it lines up?

00 11 07 42 CC

That's negative. That question's answered. Thank you much.

00 11 07 46 CMP

Okay.

00 11 09 52 CC

Hello, Apollo 11. Houston. We have an S-band configuration for you. Over.

00 11 10 00 LMP

Roger. Go ahead.

00 11 10 02 CC

Roger, Buzz. We'd like you to place the S-band antenna OMNI A switch to the Bravo position. S-band antenna OMNI switch to the OMNI position, the high gain track to MANUAL, and the high gain angles will be yaw 270, pitch minus 50. Over.

00 11 10 27 LMP

Roger. Understand. OMNI to Baker and OMNI, MANUAL. And the angles are yaw 270, pitch minus 50, and was that narrow or wide? Over.

Tape 8/3 — Page 56

00 11 10 47 CC

Stand by. Roger. We'd like it in WIDE, and you can set that configuration up now. Over.

00 11 10 56 LMP

It's in work.

00 11 13 04 CC

Hello, Apollo 11. Houston. You can terminate battery Bravo charge, and we'd like a crew status report. We're about to tell you good night. Over.

00 11 13 14 CDR

Roger. Stand by.

00 11 18 08 CDR

Houston, Apollo 11. The battery charging is complete, and the crew status report is as follows: radiation, CDR 11002, CMP 10002, LMP 09003; negative medication; fit as a fiddle. Over.

00 11 18 33 CC

Roger. Copy, 11. Thank you much. We'd like to ask one question. Have you tried the gas separator on the water? How is that working? Over.

00 11 18 45 CDR

Yes. Mike's got a couple of comments on that.

00 11 18 49 CMP

It's working good so far, Charlie. We've got one installed on the water gun and the other one installed on the spigot down in the LEB, and we - mention one problem with them is that they leak at the junction between the food bag and the water filter. However, with that exception, they seem to be working pretty good. We were getting some gas through initially, and I think that was just getting the system purged out to begin with; and the last tubeful we poured was almost free of bubbles. Over.

00 11 19 31 CC

Roger. Sounds good. We'll check in on that problem with the SPAN guys and let you know in the morning. If you have to call us tonight, we'd like you to do it on DOWNVOICE BACKUP. We're configuring the MSFN for that mode; and as far as we can see, you're cleared for some z's. Over.

00 11 19 53 CMP

Okay. Maybe we'll get around to lunch.

00 11 19 57 CC

How about a peanut butter and jelly?

END OF TAPE

Tape 9/1 — Page 57

00 12 36 34 CC

Hello, Apollo 11. Houston. Hope you aren't - we aren't disturbing you. We'd like you to terminate the NOUN 65 now. Over.

00 12 36 43 CMP

Roger.

00 12 46 00 CC

Apollo 11, Houston. Over.

00 12 46 05 LMP

Houston, Apollo 11 ...

00 12 46 08 CC

Roger, Buzz. When you stopped - or, correction - When you terminated the NOUN 65, it appears to us, you get a VERB 46 which collapsed the deadband back to 0.5. We're okay as long as you do not turn on any AUTO RCS SELECT switches. Over.

00 12 46 30 LMP

Okay. I thought that was a - better way to clear the DSKY but evidently it isn't. Roger.

00 12 46 36 CC

Roger. VERB 34 would have been a better procedure.

00 12 46 41 LMP

Yes. Thank you.

END OF TAPE

Tape 10/1 — Page 58

REST PERIOD - NO COMMUNICATIONS

Tape 11/1 — Page 59

REST PERIOD - NO COMMUNICATIONS

Tape 12/1 — Page 60

REST PERIOD - NO COMMUNICATIONS

Tape 13/1 — Page 61

REST PERIOD - NO COMMUNICATIONS

Tape 14/1 — Page 62

REST PERIOD - NO COMMUNICATIONS

Tape 15/1 — Page 63

00 22 50 15 CC

Apollo 11, Apollo 11, this is Houston. Over.

00 22 50 21 CDR

Good morning, Houston. Apollo 11.

00 22 50 24 CC

Roger, Apollo 11. Good morning.

00 22 50 32 CC

When you're ready to copy, 11, I've got a couple of small flight plan updates and your consumables update, and the morning news, I guess. Over.

00 22 51 55 LMP

Apollo 11. ...

00 22 51 58 CC

Go ahead, 11.

00 22 52 02 LMP

Roger. Standing by for your updates. Over.

00 22 52 10 CC

Okay, 11. This is Houston. At time approximately 22 30 in the flight plan, in your postsleep checklist, and in all other postsleep checklists, we'd like you to delete the statement that says "AUTO RCS JET SELECT, 16 to ON," and what we're doing here is picking this up in the procedure for exiting PTC that's in your CSM checklist. And in the CSM checklist on page Foxtrot 9-8: if you want to turn to that, we'd like to change the order of the steps in that. Over.

00 22 53 13 LMP

Stand by.

00 22 53 37 LMP

Okay. Page F 9-8. Go ahead.

00 22 53 40 CC

Okay. Right now it reads, "To exit G&N PTC," then you've got a pen-and-ink change that says, "AUTO RCS SELECT, 12 MAIN A and B." And you come down to the printed step 1. We'd like to take and move the "AUTO RCS SELECT, 12 MAIN A and B" down to be the second step, so the procedure would read, "Step 1, MANUAL ATTITUDE 3, ACCEL COMMAND; Step 2 AUTO RCS SELECT, 12 MAIN A B." Step 3 would be, "Verify DAP load," and so on. Over.

00 22 54 16 LMP

Roger. I copy. Is that AUTO RCS SELECT, 12 MAIN A, MAIN B to be the ...

00 22 54 25 CC

Roger. It should be the second step in that procedure. At time 22 40, or when you get to it, we'd like to commence a charge on battery A. And at time 24 10, we have an updated attitude for your P52 and optics calibration. Over.

00 22 55 06 LMP

Okay. 24 10. Go ahead.

Tape 15/2 — Page 64

00 22 55 09 CC

Roger. P52 and optics calibration attitude: roll 330.5, pitch 086.3, yaw 000.0. The nominal attitude that's pen-and-inked in for the P23 is still good. At time 25 30, approximately, after you complete P23, we're requesting a waste-water dump down to a nominal 25 percent. Over.

00 22 56 48 CC

Apollo 11, this is Houston. Did you copy the attitudes and the waste-water dump? Over.

00 22 56 59 LMP

Roger, Bruce. ...

00 22 57 14 CC

11, this is Houston. We're not reading you at the present time. You're way down in the noise level. Stand by, please.

00 22 57 23 LMP

Okay. Standing by.

00 22 59 04 CC

Apollo 11, this is Houston. How do you read? Over.

00 22 59 10 CMP

Roger, Houston. Apollo 11. Loud and clear. How me?

00 22 59 12 CC

Okay. Beautiful. Did you copy the attitudes for the P52 and the waste-water dump? Over.

00 22 59 20 CMP

Roger. Okay. We note the battery charge as soon as we get around to it, and the attitude for the P52 optics CAL: roll 330.5, pitch 086.3, and yaw all zeros. The attitude for the P23 as in the flight plan is okay; and I copy your battery charge. Crew status report as follows. Sleep CDR 7, CMP 7, LMP 5.5. And we've completed the postsleep checklist. Standing by for a consumable update. Over.

00 23 00 04 CC

Roger. We're requesting a waste-water dump at GET 25 30 down to a nominal 25 percent, and here we go with the consumables update. At GET of 22 hours, RCS total is minus 3.5 percent. Alfa minus 3.5 percent, Bravo minus 1.5 percent, Charlie minus 5.0 percent, minus 4.0 percent, H2 minus 2 pounds, O2 minus 4 pounds. Over.

00 23 00 59 CMP

Okay. Stand by.

00 23 01 08 CMP

I copied those consumables, and I'll read you back our RCS quantities. We got 86 percent in Alfa, 87 in Bravo, 88 in Charlie, and 90 in Delta. Over.

Tape 15/3 — Page 65

00 23 01 37 CC

Roger. I copy.

00 23 01 46 CC

And did you copy the waste-water request?

00 23 01 50 CMP

Roger. Waste water at - and we got the time on that, and it will be down to 25 percent.

00 23 01 56 CC

Okay.

00 23 06 45 LMP

Houston, 11.

00 23 06 51 CC

Apollo 11, this is Houston. Over.

00 23 06 55 CMP

Roger. We've started charging battery A, and voltage started off a lot higher than I expected. It was just a little bit shy of 40. It looks like it's dropping down some now, the battery charge holder. Seemed to me yesterday when we were doing this on battery C, it started out initially, and it went lower, the battery charge holder. Over.

00 23 07 20 CC

Roger. Stand by a second, and I'll get some reading on that.

00 23 07 29 CMP

On charging battery A: now, it's at about 39.3 and - oh, about 1.5 amps. Looks like it's gradually increasing in the ...

00 23 07 42 CC

Roger. On our CM, we're showing you at 39.11, and your current's about what you reported.

00 23 07 51 CMP

Okay. I guess you're happy, then.

00 23 07 58 CC

I think we're losing you in the noise again, 11. Stand by.

00 23 10 33 CC

Apollo 11, this is Houston. Over.

00 23 10 39 CMP

Houston, Apollo 11. Go ahead.

00 23 10 41 CC

Roger, 11. On your battery charging question, we feel that it's probably a difference between individual batteries; and it does seem to have gone away as sort of a startup transient here. Other factors that might conceivably have an influence on it would be battery temperature, things of this sort. EECOMM seems to feel that it's operating within the normal design limits. Over.

00 23 11 12 CMP

All right. Very good. Thank you.

00 23 11 14 CC

Okay.

Tape 15/4 — Page 66

00 23 14 09 CC

11, this is Houston. If you are interested in the morning news, I have a summary here from PAO. Over.

00 23 14 20 CDR

Okay. We're all listening.

00 23 14 23 CC

Okay. From Jodrell Bank, England, via AP: Britain's big Jodrell Bank radio telescope stopped receiving signals from the Soviet Union's unmanned Moon shot at 5:49 EDT today. A spokesman said that it appeared the Luna 15 space ship "had gone beyond the Moon." Another Quote: "We don't think it has landed," said a spokesman for Sir Bernard Lovell, Director of the Observatory. Washington UPI: Vice President Spiro T. Agnew has called for putting a man on Mars by the year 2000, but Democratic leaders replied that priority must go to needs on Earth. Agnew, ranking government official at the Apollo 11 blastoff Wednesday, apparently was speaking for himself and not necessarily for the Nixon administration when he said, "We should, in my judgment, put a man on Mars by the end of this century." Laredo, Texas, AP: Immigration officials in Nuevo Laredo announced Wednesday that hippies will be refused tourist cards to enter Mexico unless they take a bath and get haircuts. Huberto Cazaras, Chief of Mexican Immigration in Nuevo Laredo, said authorities in Mexico City, Acapulco, and other popular tourist spots have registered complaints about the hippies. By United Press International: Initial reaction to President Nixon's granting of a holiday Monday to Federal employees so they can observe a national day of participation in the Apollo 11 Moon landing mission mostly was one of surprise. Rodney Bidner, Associated Press, London AP: Europe is Moon struck by the Apollo 11 mission. Newspapers throughout the continent fill their pages with pictures of the Saturn V rocket blasting off to forge Earth's first link with its natural satellite. And the headline writers taxed their imagination for words to hail the feat. "The greatest adventure in the history of humanity has started," declared the French newspaper Le Figaro, which devoted four pages to reports from Cape Kennedy and diagrams of the mission. The tabloid Paris Jour proclaimed, "The whole world tells them bravo." The Communists daily L'Humanite led with the launch picture and devoted its entire back page to an enthusiastic Moon report describing the countdown and launch, the astronauts' wives and families, and backgrounding lunar activities.

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Hempstead, New York: Joe Namath officially reported to the New York Jets training camp at Hofstra University Wednesday following a closed door meeting with his teammates over his differences with pro football Commissioner Peter Rozelle. London UPI: The House of Lords was assured Wednesday that a midget American submarine would not "damage or assault" the Loch Ness monster. Lord Nomay said he wanted to be sure anyone operating a submarine in the Loch "would not subject any creatures that might inhabit it to damage or assault." He asked that the submarine's plan to take a tissue sample with a retrievable dart from any monster it finds can be done without damage and disturbance. He was told it was impossible to say if the 1876 Cruelty to Animals Act would be violated unless and until the monster found. Over.

00 23 18 07 CDR

Roger. Thank you, Bruce. Another thing on that number 2 item, we all ... before we left, and we hope we get a chance to see him another time. Over.

00 23 18 27 CC

Roger. And I understand he was down there and really enjoyed watching the launch. We all think it was pretty magnificent, and you all are doing great job up there.

00 23 18 40 CDR

Thank you.

END OF TAPE

Tape 16/1 — Page 68

00 23 57 03 CC

Apollo 11, this is Houston. Over.

00 23 57 08 CDR

Roger. Go ahead, Houston.

00 23 57 10 CC

Roger. Mike, we've got some comments on performance of P23 for today if you've got a minute to talk.

00 23 57 20 CDR

He's all ears.

00 23 57 22 CMP

Yes. Go ahead.

00 23 57 25 CC

Okay. For today, we'd like you on P23 to make a trunnion bias determination, prior to P23 sightings as called out in procedures, and also one afterwards. Our intent here is to check out the possibility that some sort of thermal effect may be giving you errors in the angular read-out in the sextant. The bias that you get beforehand should be incorporated, that is a PROCEED on NOUN 87 after you get two consecutive measurements equal to within 0.003 degrees. And, of course, move the trunnion off a couple of degrees between the measurements. The Earth should be a lot smaller in your field of view today. I'm, sure you're a lot more qualified to tell us about that than we are, but to ensure that you're getting a good angle measurement between the star and the Earth horizon, the sextant M-line, which is the line that runs through the two hash marks and is perpendicular to the R-line, should be parallel to the Earth horizon at the substellar point. And then the actual superimposition of the star upon the horizon can be made at any point in the field of view of the sextant: above, below, or on the M-line. We recommend the marks be made as rapidly as possible after AUTO maneuver. If you feel that the amount of time between the AUTO maneuver and the time you get ready to mark is excessive, or that you don't like that AUTO maneuver attitude when you get ready to mark, of course, you can use a VERB 94 - VERB 94 to get you back to the flashing 51 position to redo the AUTO maneuvers. Over.

00 23 59 41 CMP

Roger. Stand by one. We're going to stop PTC, and then we'll talk about this P23.

00 23 59 49 CC

Okay.

01 00 02 10 CMP

Houston, Apollo 11.

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01 00 02 11 CC

Go ahead, 11.

01 00 02 13 CMP

Okay. We're stopping PTC now and maneuvering to our P52 and optics CAL attitude. In regard to that P23, what I was trying to tell you yesterday was about that. The M-line is not anywhere parallel to the horizon at the roll, pitch, and yaw which you gave me to go to for the substellar point, and I was trying to maneuver off to get it parallel to the horizon when you all said that was not necessary.

01 00 02 47 CC

Roger, 11. I guess in keeping the cups of coffee score, why you get that one.

01 00 02 57 CMP

Well - Okay - Well, this morning, let's just see how close it comes to being parallel to the M-line. Before we started marking for the first time, it appeared that the computation of - of those three angles was somewhat off, and that I was wasting a lot of gas by going to those three angles and then having to make large attitude changes after that to get the M-line parallel. In some cases

it appeared to be just an accepted attitude required, and you all said that it wasn't needed. So I was marking in some cases with the M-line not parallel. I thought perhaps you had some processor for computing that offset and making sense out of that data, but as far as I know, we've got to have the M-line parallel to the horizon.

01 00 03 49 CC

Roger, 11. We don't have that capability. We do require that the M-line be parallel to the horizon in order to get a good mark. We feel that possibly the - the state vector information that you were using for your maneuver basis yesterday may have needed to be updated a little. And if you'll standby a second, we'll give you an evaluation of what we feel you'll get today by the AUTO maneuver.

01 00 04 25 CMP

Okay.

01 00 10 56 CMP

Houston, Apollo 11. Over.

01 00 11 01 CC

Go ahead, 11.

01 00 11 03 CMP

Roger. I'm getting ready to do an O2 Fuel cell purge. Do you have any particulars on this? And I assume you want these one at a time, or can I triple up? Over.

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01 00 11 13 CC

We'd like them one at a time, and stand by. I don't think we have any sequence. You can do them in any order you want.

01 00 11 23 CMP

Okay.

01 00 11 26 CC

And we're watching you on TM down here.

01 00 15 03 CMP

Houston, Apollo 11. You want to look at these NOUN 93's before I proceed on?

01 00 15 11 CC

Yes, please. Stand by a second.

01 00 15 14 CMP

Okay.

01 00 16 12 CC

11, this is Houston. On our TM, here, we're only seeing values in two registers. Can you read us out the contents of register 3, please?

01 00 16 22 CMP

Register 3: minus three balls 24.

01 00 16 25 CC

Roger. Minus three balls 24. And you can go ahead and proceed.

01 00 16 36 CMP

Okay. Proceeding at this time.

01 00 16 58 CC

11, Houston. After you've completed P52, we'd like to uplink you a new state vector so we can start out clean on this P23. Over.

01 00 17 09 CDR

Okay.

01 00 17 22 CMP

Houston, are you observing the higher O2 flow on fuel cell 3?

01 00 17 34 CDR

Houston, Apollo 11. It's triggered the MASTER ALARM three times, now. There goes number 4. It goes up to about 1.4, then oscillates back down to about 1.1. Over.

01 00 17 50 CC

Roger. We saw them 1.3 now on TM. Stand by a second.

01 00 18 01 CMP

And we're in P00, now, for a state vector.

01 00 18 06 CC

Roger. Give us ACCEPT, please.

01 00 18 13 CMP

Roger. Done.

01 00 18 41 CC

11, Houston. On your O2 flow, fuel cell 3: apparently it was flowing a little higher than the other two during purge, but the flow rate is acceptable. Over.

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01 00 18 56 CMP

Roger, It seems to be flowing a little bit more, and actually putting out more current than the other two, also. Over.

01 00 19 05 CC

Roger. We copy.

01 00 19 51 CC

11, this is Houston. We've completed the uplink; the computer is yours; you can go back to BLOCK.

01 00 19 59 CMP

Okay. Thank you.

01 00 20 31 CC

Go ahead, 11.

01 00 20 47 CDR

Houston, 11. I don't believe we were calling you right then,

01 00 20 55 CC

Roger. Out.

01 00 23 53 CMP

Houston, Apollo 11.

01 00 23 56 CC

Apollo 11, this is Houston. Go ahead.

01 00 24 00 CMP

Roger. I'm in a good attitude here to do - I have in the sextant this last P52 star, star 37. Is that all right for the optics calibration to save some gas, or do you want to go over to star 40?

01 00 24 23 CC

Star 37 will be fine for the optics calibration. And we haven't noticed a VERB 66, yet, after our state vector uplink. Over.

01 00 24 33 CMP

Okay.

01 00 24 37 CC

When you move into P23, we recommend that you use the CMC-computed angles for your AUTO maneuver and see how that works out. If it doesn't bring you up with the M-line parallel to the horizon to the substellar point, we will see if we can get you some ground-computed angles. I guess the big thing here is to make sure that the M-line is parallel to substellar points so we can get a good angular measurement. Over.

01 00 25 06 CMP

Yes. I believe.

01 00 25 08 CC

Roger. Over.

01 00 29 25 CMP

Houston, Apollo 11. Marking on this star, I get a NOUN 87 twice in a row of five balls, so that's sufficient for a count.

01 00 29 33 CC

That's certainly very sufficient.

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01 00 29 40 CMP

Okay. Now I want to go to P00, and I am going to take your three angles and do a verify of 49 maneuver to your substellar point. Okay?

01 00 29 53 CC

Okay. We recommend that for the first star, if we gave you a new state vector, we'd like to try the CMC-computed angles for your AUTO maneuver.

01 00 30 07 CMP

Okay.

01 00 30 18 CC

And have you hit PROCEED on this display to enter the zero?

01 00 30 23 CMP

Not yet.

01 00 30 24 CC

Okay.

01 00 30 54 CC

11, Houston. Over the past 2 hours we have seen a slight continuing increase in partial pressure Of CO2. Have you in fact changed the CO2 canister yet this morning? We don't need to do it right now; we'd just like to confirm it on our instrumentation - is in good shape. Over.

01 00 31 13 CMP

No. We haven't changed any canisters this morning.

01 00 31 19 CC

Okay. Then you can plan on accomplishing that after P23 is over and you've got the LEB clear.

01 00 31 22 CMP

All right.

01 00 31 57 CMP

Houston, Apollo 11. We're in process of maneuvering to P23 in desired attitude. It likes roll 8.37, pitch 61.33, and yaw 339.87. Over.

01 00 32 13 CC

Roger. We copy. And that is for star 01?

01 00 32 19 CMP

Star 01, right near the horizon. Code 110.

01 00 32 22 CC

Roger.

01 00 41 07 CMP

Houston, Apollo 11. On this star, the AUTO maneuver works just fine. I am right at the substellar point. Everything looks beautiful except there is no star in sight. It is just not visible.

01 00 41 20 CC

Roger. Is this for star 01?

01 00 41 23 CMP

That's correct.

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01 00 41 29 CC

You are not getting any reflections or anything like that that would obscure your vision, are you?

01 00 41 40 CMP

Well, of course, the Earth is pretty bright, and the black sky, instead of being black, has sort of a rosy glow to it. The star, unless it is a very bright one, is probably lost somewhere in that glow, but it is just not visible. I maneuvered the reticle considerably above the horizon to make sure that the star is not lost in the brightness below the horizon. However, even when I get the reticle considerably above the horizon so the star should be seen against the black background, it still is not visible.

01 00 42 16 CC

Roger. We copy. Standby a minute, please.

01 00 42 47 CC

11, this is Houston. Can you read us the shaft and trunnion angle off the counters?

01 00 42 55 CMP

Yes. I will be glad to. Shaft 331.2 and trunnion 35.85.

01 00 43 04 CC

Roger. Thank you.

01 00 45 35 CMP

It's really a fantastic sight through that sextant. A minute ago, during that AUTO maneuver, the reticle swept across the Mediterranean. You could see all of North Africa, absolutely clear; all of Portugal, Spain, southern France; all of Italy, absolutely clear. Just a beautiful sight.

01 00 45 54 CC

Roger. We all envy you the view up there.

01 00 45 59 CMP

But still no star.

01 00 47 19 CC

11, this is Houston. Over.

01 00 47 23 CMP
Roger. Go ahead, Bruce.

01 00 47 25 CC
On our ground computers we confirm the shaft and trunnion angle that you have as being pointed at the star. However, it looks as though that shaft and trunnion angle is also pointing into the structure of the LM, so that while you will be getting the Earth's horizon, the star ... is obscured by the LM. We recommend an AUTO maneuver to the attitudes pen-and-inked into the flight plan. Roll 1772, pitch 2982 and yaw 330.0. Over.

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01 00 48 04 CMP
Okay. Fine. Let ts try that.

01 00 53 59 SC
...

END OF TAPE

Tape 17/1 — Page 75

01 01 06 54 CC

11, this is Houston. While you're maneuvering, could we get a LM/CM DELTA-P reading from you? Over.

01 01 07 01 CMP

Roger. Just a tad under 1, Bruce, 0.95.

01 01 07 05 CC

Roger. 0.95.

01 01 11 14 CC

Apollo 11, Houston.

01 01 11 17 CMP

Go ahead.

01 01 11 21 CC

Is the Commander aboard?

01 01 11 36 CDR

This is the Commander.

01 01 11 39 CC

I was a little worried. This is the backup Commander still standing by. You haven't given me the word yet. Are you GO?

01 01 11 48 CDR

You've lost your chance to take this one, Jim.

01 01 11 53 CC

Okay. I concede.

01 01 13 36 CMP

Houston, Apollo 11.

01 01 13 41 CC

Go ahead, 11.

01 01 13 43 CMP

Okay. Our maneuver is complete, and at this attitude the M-line is exactly 90 degrees out of phase. It is exactly pointed along the vector toward the center of the Earth instead of being parallel to the right.

01 01 14 00 CC

Roger.

01 01 14 16 CMP

I'm going to hold right here for your next suggestion.

01 01 14 21 CC

Roger.

01 01 18 19 CMP

Okay, Houston. It appears to be okay now; We've changed our attitude slightly, and I have a star and I'm maneuvering to get the M-line parallel.

01 01 18 34 CC

This is Houston. Roger. We copy.

01 01 20 29 CDR

Houston, Apollo 11. You - Stand by one.

01 01 36 08 CMP

Houston, Apollo 11. Are you copying these NOUN 49's that have been going through?

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01 01 36 14 CC

Yes. We surely are. Let's see: plus 0.1 and a plus 0.2 on nautical miles and feet per second. Over.

01 01 36 22 CMP

Roger.

01 01 43 45 CC

11, this is Houston. Over.

01 01 43 54 CMP

Go ahead.

01 01 43 56 CC

Yes, Mike. We show you in VERB 59 right now. Over.

01 01 44 01 CMP

That's right. I - I haven't entered - I gave the - I gave it back to the computer for a second. I put the mode switch from MANUAL back to CMC while I fooled with the DSKY, and the computer drove the star off out of sight. So the delay here has been in going back to MANUAL and finding the star again, which I've finally done. And - Just a second here, I'll go to ENTER and get a 51 and mark on it. As I say, for some reason the computer drove the star off out of sight.

01 01 44 47 CC

Okay. Roger. Out.

01 01 48 14 CC

Apollo 11, this is Houston. Over.

01 01 48 21 CMP

Go ahead.

01 01 48 24 CC

Roger. We show you as a little less than an hour to the midcourse correction number 2 burn. We recommend that you terminate the P23 activities here and press on with the waste-water dump, which we need from you, and get it ready for the burn. Over.

01 01 48 40 CMP

Okay.

01 01 48 44 CC

And I have your midcourse correction number 2 PAD when you're ready to copy.

01 01 48 50 CMP

Stand by.

01 01 49 15 CMP

Roger, Houston. Apollo 11, ready to copy MCC 2.

01 01 49 20 CC

Apollo 11, this is Houston. Midcourse correction number 2. SPS/G&N 63059, plus 097, minus 020, GET ignition 02644 5792, plus 00118, minus 00003, plus 00177, roll 277 355 015, NOUN 44 BLOCK is NA, DELTA-VT 00213 003 00168, sextant star 30 2082 370.

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The rest of the PAD is NA. GDC align: Vega and Deneb. Roll align 007 144 068. No ullage. LM weight: 33302. For your information, your heads will be pointed roughly towards the Earth on this burn. Read back. Over.

01 01 51 12 CMP

Roger. Midcourse correction number 2. SPS/G&N: 63059, plus 097, minus 020 02644 5792, plus 00118, minus 00003, plus 00177 277 - Are you still copying?

01 01 51 50 CC

Roger. Still copying. Go ahead. Apollo 11, this is Houston. I copied your transmission about roll 277, and go ahead from roll 277. Over.

01 01 52 19 CMP

Roger. 355 015, NA, 00213 003 00168 30 2082 370. Vega and Deneb 007 144 068. No ullage. LM weight: 33302. Heads towards the Earth. Over.

01 01 52 46 CC

11, this is Houston. Readback correct. Out.

01 01 54 02 CC

Apollo 11, Houston. Over.

01 01 54 08 CMP

Go ahead, Houston. Apollo 11.

01 01 54 09 CC

Roger. We'd like you to terminate battery A at GET 26 hours and reinitiate battery A charge after midcourse correction 2. Over.

01 01 54 23 CMP

Apollo 11. Roger.

01 01 54 27 CC

Roger. Out.

01 01 59 37 CC

11, this is Houston. Over.

01 01 59 41 LMP

Go ahead.

01 01 59 43 CC

Roger. If you can give us ACCEPT, we'll send you up a state vector and a target load for the maneuver.

01 01 59 52 LMP

Okay. Give us 1 minute to check the P23 damage.

01 01 59 58 CC

Sure thing.

01 02 00 31 LMP

Houston, Apollo 11. The DSKY's yours.

01 02 00 35 CC

Houston. Roger. Out.

01 02 03 49 CC

11, this is Houston. We've completed the uplink. The computer's yours.

01 02 03 54 LMP

Thank you.

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01 02 07 17 CMP

Houston, Apollo 11.

01 02 07 21 CC

Apollo 11, this is Houston. Over.

01 02 07 24 CMP

Roger. Wonder if you have a star that might be a little closer to the direction we're burning than the one you gave us.

01 02 07 33 CC

Roger. We're going to rework the attitude in the sextant star for you in order to improve the high-gain antenna coverage, and we'll have that for you in a few seconds.

01 02 07 43 CMP

Fine. We're already maneuvering ...

01 02 07 51 CC

Roger.

01 02 08 02 CMP

Maybe you can make it just the change in roll.

01 02 08 07 CC

Roger.

01 02 08 45 CC

Apollo 11, this is Houston. Over.

01 02 08 49 CMP

Go ahead.

01 02 08 51 CC

Roger. On your attitude for the burn: we'd like you to use roll 096, pitch 356, yaw 018. That will give you a sextant star of 01, shaft 253.8, trunnion 24.2. Over.

01 02 09 36 CMP

... 356 ...

01 02 09 51 CC

11, this is Houston. We are having difficulty reading you through the noise. Could you read back again, please? Over.

01 02 10 05 CMP

Roger, Houston. Apollo 11. Do you copy?

01 02 10 10 CC

Roger. Very weakly in the noise, but I think I can copy. Go ahead.

01 02 10 19 CMP

Okay. Roll 096 356 018 ... star 01 ...

01 02 10 38 CC

Roger. I got all of that except trunnion. It's trunnion 242. Over.

01 02 12 19 LMP

Houston, Apollo 11. How do you read me now on OMNI A?

01 02 12 22 CC

Roger. Loud and clear, 11.

01 02 12 26 LMP

Okay. We'll stay on OMNI A for a while, then.

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01 02 12 30 CC

Okay. I got all your readback except the value for trunnion. If it's 242, confirm, please.

01 02 12 36 CMP

Roger. 242.

01 02 12 38 CC

Okay.

END OF TAPE

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01 02 38 29 CDR

Houston, Apollo 11. Could you give us a couple of high-gain antenna angles, please?

01 02 38 35 CC

Roger. Stand by, 11.

01 02 38 44 CC

Roger, 11. Pitch minus 35, yaw 0. Over.

01 02 38 50 CDR

Thank you.

01 02 39 03 CDR

We got them.

01 02 39 05 CC

Okay.

01 02 39 28 CDR

Houston, Apollo 11. How do you read high gain?

01 02 39 30 CC

Read you loud and clear on high gain down here, and everything's looking good from our standpoint for your burn. Over.

01 02 39 36 CDR

Okay, Bruce.

01 02 45 38 CDR

Houston, burn completed. You copying our residuals?

01 02 45 40 CC

That's affirmative.

01 02 46 00 CDR

And, Houston, looked like we saw about 87 or 88 psi on chamber pressure that time. I'd like you to look at that on the ground.

01 02 46 13 CC

Roger, 11. We'll take a look at that and get back in a few minutes.

01 02 46 38 CC

11, Houston. On our real-time telemetry we saw 95 to 97 psi on chamber pressure. We'll - We will look at the recordings down here, thought, and get back with you again. Over.

01 02 46 41 CDR

Okay. Thank you.

01 02 46 50 CC

And we've copied your residuals, 11.

01 02 46 56 CDR

Roger. No, we're not going to trim those ...

01 02 49 51 CC

11, Houston. Could we get your DELTA-V counter reading, please, from this burn?

01 02 50 00 LMP

That's minus 3.8.

01 02 50 02 CC

Minus 2.8?

01 02 50 04 LMP

3.8.

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01 02 50 06 CC

Roger. Copy minus 3.8.

01 02 51 04 CDR

Houston, is there anything else you need on the burn status report?

01 02 51 15 CC

This is Houston. Negative, 11.

01 02 51 23 CDR

Roger. Thank you.

01 02 54 41 CC

Apollo 11, this is Houston. Over.

01 02 54 45 CMP

Roger. Apollo 11.

01 02 54 47 CC

Roger. I just wanted to remind you that we haven't noticed on the TM the VERB 66 after the burn. And for your information, we played the recorded TV back last night, I believe, after you all turned in for your rest period, and the pictures came out quite well. Over.

01 02 55 10 CMP

Did you get any usable pictures out of MILA on that first pass?

01 02 55 15 CC

Not that we've seen. We had word on the voice loop that MILA reported that they had gotten a minute's worth of TV signal, and Goldstone reported that they had gotten about a minute's worth of modulation but that they weren't able to get anything off of it.

01 02 55 35 CMP

Okay. Thanks.

01 02 55 40 CC

Okay. We have another input here, 11, that the MILA data was recognizable as a picture, but we don't have any evaluation as to the quality of the picture. Over.

01 02 55 53 CMP

Okay.

01 02 55 55 CC

And for our information, we've been watching a PCO2 again. Did you change a lithium hydroxide canister this morning? Over.

01 02 56 08 CDR

Yes. We did, and we've been seeing 1.7 percent in the spacecraft ever since.

01 02 56 14 CC

Roger. That agrees with our data.

01 02 56 19 CDR

1.7 millimeters.

01 02 56 21 CC

Roger. We copy.

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01 02 57 00 CDR

Houston, Apollo 11. We're starting our maneuver to PTC attitude.

01 02 57 05 CC

Roger.

01 02 59 21 CC

11, this is Houston. Over.

01 02 59 26 LMP

Go ahead.

01 02 59 27 CC

Roger. From a propellant-balancing standpoint, we recommend that you use quads Alfa and Bravo to start the PTC maneuvers. Over.

01 02 59 39 LMP

Roger. Understand Alfa and Bravo.

01 02 59 41 CC

Roger. Out.

01 03 06 14 CC

11, this is Houston. Over.

01 03 06 19 CDR

Go ahead, Houston.

01 03 06 21 CC

Roger. For CRYO-balancing purposes, we'd like you to turn the heater and oxygen tank number 1 off at this time. Over.

01 03 06 32 CDR

Okay. Stand by.

01 03 06 35 CC

Everything else in the CRYO system remains the same.

01 03 06 39 CDR

Okay.

01 03 06 56 CMP

Okay. We have O2 heater tank 1 off.

01 03 07 01 CC

Houston. Roger. Out.

01 03 07 10 CMP

How is EECOMM today? Is he happy with all those good things?

01 03 07 14 CC

Oh, EECOMM is happy, and after you get PTC set up, we've got a little procedure from EECOMM here to check out the O2 flow and the O2 flow sensor in your cabin enrichment. Over.

01 03 07 29 CMP

Okay.

01 03 07 35 CMP

It'll be a while, Bruce. We're just now arriving in PTC attitude, and we're going to our 20 minutes of monitoring thruster activity.

01 03 07 42 CC

Roger. We copy. He'll be here.

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01 03 13 03 CMP

Houston, Apollo 11. Are you going to take control of the OMNI's now and switch us between B and D?

01 03 13 08 CC

This is Houston. Stand by one.

01 03 13 35 CC

11, Houston.

01 03 13 38 CMP

Go ahead.

01 03 13 40 CC

Mike, how about selecting Bravo at this time, and I'll give you a COMP configuration here, shortly.

01 03 13 49 CMP

Okay.

01 03 14 24 CMP

That PTC sure worked well last night.

01 03 14 28 CC

Outstanding.

01 03 14 55 CC

11, Houston.

01 03 15 00 CMP

Go ahead.

01 03 15 02 CC

Okay. Roll for the COMM situation: have S-band antenna OMNI A in Bravo, S-band antenna OMNI to OMNI, high-gain track to MANUAL, and the pitch is minus 50 and yaw is 270.

01 03 15 24 CMP

You may have to repeat some of that, James. We've got a LM guy taking care of the high gain right now.

01 03 15 30 CDR

Yes, and he is eyeballing the Earth.

01 03 15 32 CMP

He's got his head out the window.

01 03 15 35 CC

I understand, I had trouble on 12 with him, too.

01 03 15 42 LMP

Say again what you'd like.

01 03 15 44 CC

Okay, The S-band antenna OMNI A switch to Bravo which you have now, and S-band antenna OMNI to the OMNI position, and the high-gain track to the MANUAL position, and the pitch and yaw angles are minus 50 for pitch and yaw is 270.

01 03 16 10 LMP

Minus 50 and 270.

01 03 17 09 LMP

Hey, Jim, I'm looking through the monocular now, and to coin an expression, the view is just beautiful. It's out of this world. I can see all the islands in the Mediterranean. Some larger and smaller islands of Majorca, Sardinia, and Corsica.

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A little haze over the upper Italian peninsula, some cumulus clouds out over Greece. The Sun is setting on the eastern Mediterranean now. The British Isles are definitely greener in color than the brownish green that we have in the islands, in the peninsula of Spain. Over.

01 03 18 03 CC

Roger. I understand that the Northern Africa - Mediterranean area is fairly clear today, huh?

01 03 18 12 LMP

Right.

01 03 18 14 CDR

Yes. We see a bunch of roads with cars driving up and down, too.

01 03 18 19 CC

Do you find that the monocular is any good to you, Buzz?

01 03 18 27 LMP

Yes, It would be nicer if it had another order of magnitude of power on it. Of course, it has a tendency to jiggle around a little bit, and you might want to have some sort of a bracket. I hate to use that word though.

01 03 18 53 LMP

Got an anticyclone going in the southern hemisphere southeast of Brazil, and some - Well, the diameter of it must be over 2000 miles across.

01 03 19 15 CC

How does the weather look up in the southern part of the western hemisphere, or up in the United States area?

01 03 19 26 LMP

Well, you all are just beginning to come over the limb now. I can see parts of Central America, and it looks to be fairly clear there. The islands in the Caribbean are beginning to come in and rather a few streaming lines of clouds. Looks like there is a system up to the - well, off of Greenland that has some large cloud streamers extending back down to the southwest. The east coast of the U.S. is just coming into view now, and it doesn't look too bad that I can see right now. We may have some pretty good shots later on this afternoon. Over.

01 03 20 16 CC

Roger. Thank you.

01 03 21 50 LMP

Houston, Apollo 11.

01 03 21 54 CC

Go ahead, 11.

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01 03 21 56 LMP

I've got a comment about the point on the Earth where the Sun's rays reflect back up toward us. In general, the color of the oceans is mostly uniform and it's bright and darker blue except for that region that's about one-eighth of an Earth's radius in diameter; and in this circular area, the blue of the water turns a grayish color, and I'm sure that's where the Sun's rays are being reflected back on up toward us. Over.

01 03 22 41 CC

Roger, Buzz. We noticed the same thing. It's very similar to looking at a light shining on something like a billiard ball or a bowling ball. You get this bright spot in the blue of the water, and that turns it to sort of a grayish color.

01 03 22 57 LMP

Yes. Is there a Navy term for that?

01 03 23 00 CC

(Laughing.) A lot of gray paint.

01 03 25 27 CC

11, Houston.

01 03 25 32 CMP

Go ahead, Houston.

01 03 25 38 CC

Mike, are you satisfied with P23 now?

01 03 25 43 CMP

Yes, I'm happy with the last updates we got, you know, in terms of what it did to our state vector. Still not altogether happy with the various procedures. If we could pick stars within the smaller range of truncation angles so that you could allow P23 to pick its own maneuver and go to that substellar point and then have that star visible, that would seem to me to be the simplest and best way to do it.

01 03 26 14 CC

How about the - -

01 03 26 19 LMP

... correction on that last ...

01 03 26 20 CC

How about the horizon now? Is it pretty well defined for you and no longer hazy?

01 03 26 24 CMP

Yes. We're far enough out now that the - I think the horizon definition variation is lost in the North.

01 03 26 57 LMP

Hey, Jim.

01 03 27 03 CC

Go ahead, Buzz.

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01 03 27 06 LMP

Looks like the best way to get a steady view through the monocular is just steady it out and let it close when it's in front of your eye, and then you kind of float up next to it so that you're not touching it at all. It has a very slow drift, and you get a better - steadier view that way.

01 03 27 25 CC

Sounds good.

01 03 27 47 CC

How does it feel to be airborne again, Buzz?

01 03 27 51 LMP

Well, I'll tell you, I've been having a ball floating around inside here, back and forth up to one place and back to another. It's like being outside, except more comfortable.

01 03 28 04 CC

It's a lot bigger than our last vehicle.

01 03 28 06 CMP

... kept me busy, I'm ...

01 03 28 10 CMP

Say again about Buzz -

01 03 28 11 LMP

Yes. It sure is nice in here.

01 03 28 13 CC

I said it's a lot bigger than the last vehicle that Buzz and I were in.

01 03 28 17 CMP

Oh, yes. It's been nice. I've been very busy so far. I'm looking forward to taking the afternoon off. I've been cooking, and sweeping, and almost sewing, and you know, the usual little housekeeping things.

01 03 28 30 CC

It was very convenient the way they put the food preparation system right next to the NAV station.

01 03 28 43 CDR

Everything is right next to everything in this vehicle.

01 03 28 48 LMP

Not if you're in the ...

01 03 28 53 CDR

Jim, it's been a little warm in the machine throughout yesterday and last night during the PTC. It cooled off somewhat with the windows buttoned up, and we've seen suit temperatures of about - the high 40's and cabin temperatures in the low 60's. But this seems to be still a little bit on the warm side.

01 03 29 28 CC

I understand that it got a little warm during the day and cooled down a little bit when you put the shades up, but you're still a little bit warm. Do you have any moisture condensation or anything like that on the wall?

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01 03 29 40 CDR

No, we haven't been able to detect any moisture anywhere in the spacecraft. It seems to be fine.

01 03 29 50 LMP

One of the hydrogen filters - the one that we've got on the hot water - seems to keep flowing when you remove one of the food bags from it. Its flow rate is quite small, right near the end of one out, and that contributes a little bit of moisture to the atmosphere.

01 03 30 16 CMP

Yes, that hydrogen thing, it's - I'm not sure, but I think it's a backpressure problem. If the thing sees any backpressure at all, like when the bag is attached, well the flow rate will slowly decrease to where it's almost zero, and you wait, and you wait, and you wait for that last ounce. You think you have it and you remove the bag, and then you very rapidly thereafter see maybe a glob the size of a dime or a quarter come out and just hang there. That appears to be true even though the opening into the bag is not restricted.

01 03 30 49 CC

Understand.

01 03 30 54 LMP

In general, I think they do quite a good job, especially on the guns, in removing a lot of the hydrogen bubbles.

01 03 31 04 CC

Have the water temperatures been good? Are you getting hot water?

01 03 31 12 LMP

Yes. It seems reasonably warm.

01 03 31 17 CMP

We made three cups of coffee today. The last one - you know when all the plumbing was warmed up, the hydrogen gun and everything, was warmest of the three. I don't know who had that one - Neil, did you have that one? How was your coffee? You didn't drink it till later, did you? Anyway, it's pretty good. It's not piping hot, but it sure beats stone-cold coffee.

01 03 31 49 CMP

Jim, we've been sitting here a little over 20 minutes now, How does the thruster firing activity look? Are you ready to go on with this PTC?

01 03 31 56 CC

Roger. Stand by.

01 03 32 00 CC

We're all set to go, Mike.

01 03 32 04 CMP

Okay. I'll press on then.

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01 03 35 59 CMP

Houston, Apollo 11. PTC has started and it looks good.

01 03 36 06 CC

11, Roger. This is Houston. Roger. Out.

01 03 47 22 CC

Apollo 11, this is Houston. Over.

01 03 47 27 CDR

Go ahead, Houston.

01 03 47 29 CC

Roger. If you're free for a couple of minutes, we have a procedure here that will let us verify the O2 flow transducer and at the same time get some more of our cabin enrichment out of the way. Over.

01 03 47 46 CDR

Stand by.

01 03 48 37 CDR

Go ahead, Houston. We're ready to copy.

01 03 48 41 CC

Roger. The primary purpose of this is, as I mentioned, to let us check out your O2 flow transducer. However, we still need about 2 hours' worth of cabin enrichment, so we'd like to keep the vent that we're going to set up going for this purpose. Okay. We want you to install the cabin vent quick disconnect which you'll find in compartment R-6, that is Romeo 6, on the urine connector on panel 251. When this is completed, verify that the waste stowage vent valve is closed, and then open or position the waste management overboard drain to the DUMP position. Over.

01 03 49 40 CDR

Okay. Understand that. Install the cabin quick disconnect out of R-6 on the 251 urine connector and verify that the waste dump valve is closed, and say again the last part.

01 03 50 02 CC

Roger. And then put the waste management overboard drain valve into the DUMP position. Over.

01 03 50 16 CDR

Roger. Put the waste management overboard drain valve to the DUMP position.

01 03 50 20 CC

Right. That's the one down on panel 251 also. And we'll watch your O2 flow on telemetry down here.

01 03 52 49 CDR

Okay, Houston. That configuration is set up.

01 03 52 57 CC

11, this is Houston. Say again, please.

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01 03 53 02 CDR

You do have the O2 flow transducer checkout setup accomplished.

01 03 53 08 CC

Okay. Understand you have opened the drain valve at this time.

01 03 53 13 CDR

That's ... It's in DUMP.

01 03 53 15 CC

Roger. We're not getting telemetry data from you right due to low signal strength. There it comes back. I expect it'll probably take us anywhere from 15 minutes to half an hour to see an increase in O2 flow due to the size of the cabin and of course of the small size of the drain. Over.

01 03 53 36 CDR

Roger.

01 04 07 16 CMP

Houston, Apollo 11.

01 04 07 18 CC

Go ahead, 11.

01 04 07 21 CMP

Roger. I've got the world in my window for a change and looking at it through the monocular, it's really something. I wish I

could describe it properly. The weather is very good. South America is coming around into view. I can see on the - what appears to me to be upper horizon, a point that must be just about Seattle, Washington, and from there I can see all the way down to the southern tip of Tierra del Fuego and the southern tip of the continent.

01 04 07 55 CC

Roger. Sounds like you've got a beautiful view up there.

01 04 08 01 CMP

Absolutely fantastic. I hope the pictures come out. We're rotating around where it's going out of view again.

01 04 08 09 LMP

I'm waiting to pick it up in the sextant.

01 04 08 14 CC

Sounds like one of these rotating restaurants.

END OF TAPE

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01 04 30 33 CC

Apollo 11, this is Houston. Over.

01 04 36 09 LMP

Houston, Apollo 11. Do you need some help keeping OMNI's locked on us?

01 04 36 15 CC

Apollo 11, this is Houston. Negative. We had a command computer at the Madrid site go down. We had to switch over to Ascension temporarily. We're now back remoting through Madrid, and the computer is back, and we're ready to resume control of your OMNI's and full communication. Over.

01 04 36 38 LMP

Okay. You've got it.

01 04 36 39 CC

Okay. One thing that we did miss in the dropout in the noise here is your LM/CM DELTA-P reading for about 28 hours GET. Over.

01 04 37 05 LMP

Okay. The LM/CM DELTA-P is 0.98.

01 04 37 10 CC

Roger. 0.98, and what have you been reading for O2 flow on your onboard gage? Over.

01 04 37 23 LMP

Well, right now, after we put that gadget in, we've got it back to 0.35. Before that, we were reading on scale level. I think ours is relatively correct, at least when time comes for the water accumulator to kick in at 10 seconds, it goes on up to about 0.75, 0.8, something like that.

01 04 37 50 CC

This is Houston. Roger. Out.

01 04 38 43 CC

And, 11, this is Houston. A little more information based on our analysis of your last SPS burn: it looks like you got a good solid burn there. We show 94 psi chamber pressure and it looks like the SPS is definitely GO. Over.

01 04 39 06 LMP

Good to hear it.

01 04 39 08 CC

Roger. We thought you'd feel that way about it.

01 04 39 21 LMP

We're right in the middle of - well either ... or salmon salad, or something like that. That's probably why we're not answering you right away.

01 04 39 32 CC

Okay. Well, we don't want - -

01 04 39 33 LMP

My compliments to the chef, that salad salmon is outstanding.

Tape 19/2 — Page 91

01 04 39 41 CC

Roger. Understand that's the salad salmon. Over.

01 04 39 49 LMP

Something like that, salmon salad.

01 04 39 51 CC

There we go, the salmon salad, very good.

01 04 39 57 LMP

Okay. Bruce, we're coming up on the water accumulator activity, and it's going on up to 0.85, oh, about 0.95 and it reached a peak there and then gradually dropped back on down to 0.6 now, 0.4, and it looks like it's pretty well - pretty well leveling off back down to 0.35. Over.

01 04 40 30 CC

Roger, We're copying that.

01 04 41 27 CC

11, Houston.

01 04 41 31 CDR

Go ahead.

01 04 41 32 CC

Roger. On that 2O flow transducer down here on telemetry, our values are agreeing pretty well with what you read out onboard, and the EECOMM's have been noticing this cycle, but it still looks like the indicated rate is lower than what we would expect. We're still working on the problem, and we'll let you have a more complete diagnosis on it in a little while.

01 04 42 03 CDR

Okay. It's a tight fix then.

01 04 42 04 CMP

We run a tight ship.

01 04 42 08 CC

Roger. Is that music I hear in the background?

01 04 42 15 CMP

Buzz in singing.

01 04 42 16 CC

Okay.

01 04 42 31 CMP

Pass me the sausage, man.

01 05 32 09 CC

Apollo 11, this is Houston. Over.

01 05 32 13 CDR

Go ahead, Houston.

01 05 32 14 CC

Roger, 11. We've been watching your activity on the DSKY there, and by selecting another major program with a VERB 37 ENTER and all that, we show you collapsing the deadband in PTC and having driven the CMC rate from 0.3 degrees per second down to 0 degrees per second, although of course, with all the AUTO RCS coils shut off, you're not firing any thrusters. Over.

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01 05 32 54 CDR

Okay. What do you recommend?

01 05 32 59 CC

Well, you can just continue in your present configuration in PTC. However, if you go to turn any thrusters on, the CMC would then try to bring you into an attitude hold position rather than continuing with the PTC. Over.

01 05 33 20 CDR

Roger. I understand.

01 05 33 21 CC

Okay.

01 05 33 38 CDR

And, Houston, we're just looking at you out our window here. Looks like there's a circulation of clouds that just moved east of Houston over the Gulf and Florida area. Did that have any rain in it this morning?

01 05 33 59 CC

Roger. Our report from outside says that it's raining out here, and looks like you've got a pretty good eye for the weather there.

01 05 34 09 CDR

Yes. Well, it looks like it ought to clear up pretty soon from our viewpoint. The western edge of the weather isn't very far west of you.

01 05 34 20 CC

Okay.

END OF TAPE

Tape 20/1 — Page 93

01 05 58 15 CC

Apollo 11, this is Houston. Over.

01 05 58 22 CDR

Go ahead, Houston.

01 05 58 23 CC

11, this is Houston. As a result of our venting through the waste management drain, we've concluded that your O2 flow rate sensor is, in fact, malfunctioning. I mentioned when you talked us through the cyclic water accumulator dump that even though it was moving, probably indicating a higher flow rate, it didn't seem to be indicating a flow rate that is high enough; and based on that and the flow that we're getting right now, we've concluded that the transducer is malfunctioning. We'd like to continue the O2 flow for about another hour, shutting it off at about 31 hours GET, to get the O2 concentration in the vehicles up to - in the vehicles up to where it will be acceptable for LM checkout. Over.

01 05 59 27 CDR

Okay. Does it look to you like it just has a bias on it?

01 05 59 45 CC

Roger, 11. It does seem to be a bias. Looks like it has a fairly high threshold before it starts indicating. EECOMM seems to think, though, that for high flow rate purposes, it will still give you a relative indication during the mission. Over.

01 06 00 10 CDR

Okay. We understand. Thank you.

01 06 12 20 CC

Apollo 11, this is Houston. We would like you to terminate charging on battery A at GET 30 plus 15. Over.

01 06 12 31 CDR

Okay. 30 plus 15 for battery A charge terminate.

01 06 12 36 CC

Roger. Out.

01 06 15 34 CC

Apollo 11, this is Houston. Over.

01 06 15 41 CDR

Go ahead, Houston.

01 06 15 42 CC

Roger. If you're free for a minute, I've got some updates to the P37 PAD's that we passed up to you yesterday afternoon, I guess. As a result of doing midcourse correction number 2, the DELTA-V required in the TLI plus 35, 44, and 53 PAD's have changed slightly. Over.

Tape 20/2 — Page 94

01 06 16 18 CDR

Roger. Standing by to copy.

01 06 16 21 CC

Okay. TLI plus 35 PAD: the DELTA-VT should be 7992 instead of 8016. TLI plus 44 - It should be 6112 instead of 6141. And TLI plus 53 - It should be 8172 instead of 8209. Read back. Over.

01 06 16 57 CDR

Roger. Understand. 7992, 6112, 8172. Over.

01 06 17 05 CC

Roger. Readback correct. Out.

01 06 29 28 CC

Apollo 11, this is Houston. Over.

01 06 29 34 CDR

Go ahead, Houston.

01 06 29 39 CC

11, this is Houston. Goldstone reports they are receiving a TV picture coming down from you all, a little snowy, but a good TV picture. Over.

01 06 29 54 CDR

Roger. We're just testing the equipment up here.

01 06 29 59 CC

Roger.

01 06 30 03 CDR

Ask them if they can read the numbers.

01 06 30 06 CC

Okay. Stand by.

01 06 30 24 CC

Goldstone, this is Houston CAP COMM. Over.

01 06 30 42 CT

Houston CAP COMM, Goldstone M&O. Go ahead.

01 06 30 45 CC

Roger. Stand by a minute, Goldstone.

01 06 30 51 CC

11, this is Houston. What numbers are you referring to? Over.

01 06 31 00 CDR

Well, I guess if they can't see any numbers, why, it's kind of a lost cause.

01 06 31 04 CC

Negative. Standby. We wanted to know - -

01 06 31 06 CDR

...

01 06 31 07 CC

We wanted to know what numbers before we asked them.

01 06 31 12 CDR

Okay. I'm showing them the DSKY, and I'd like to know whether they can read what's showing on the DSKY, and also whether they can see P-R-O-G, V-E-R-B, and N-O-U-N. Over.

01 06 31 22 CC

Roger. Stand by a second.

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01 06 31 26 CC

Goldstone M&O, Houston CAP COMM. Over.

01 06 31 29 CT

CAP COMM, Goldstone. Go ahead.

01 06 31 31 CC

Roger. Did you copy the spacecraft request?

01 06 31 34 CT

That's affirmative. I am reading the numbers on our monitor here.

01 06 31 38 CC

Okay, that's - Roger. That's both the numbers on the DSKY itself, and the little words like PROGRAM and VERB, NOUN, COMPUTER ACTIVITY, things of this sort?

01 06 31 58 CT

Roger. I can read the numbers clearly. We can't distinguish what the words are, because it is a little snowy.

01 06 32 09 CC

Roger.

01 06 32 11 CT

Okay. I read VERB, NOUN, and PROGRAM.

01 06 32 19 CC

Roger. Do you see - Over in the lefthand corner, there's a big square one that says COMPUTER ACTIVITY, COMP ACTIVITY?

01 06 32 25 CT

Roger. I see a flash occasionally in that area.

01 06 32 28 CC

Roger. that's the one.

01 06 32 31 CT

Okay. It looks like he's moved the camera at this time.

01 06 32 34 CC

Roger.

01 06 32 36 CC

11, this is Houston. Goldstone M&O reports that they can read the numbers on the DSKY. They can also read VERB, NOUN, PROGRAM, and see the COMP ACTIVITY light flashing. Over.

01 06 32 49 CDR

Very good. Thank you.

01 06 32 51 CC

And they also report you appear to have panned the camera over to another location now.

01 06 32 57 CDR

Yes, we're going to work on something else.

01 06 33 01 CC

Roger.

01 06 51 11 CMP
Houston, Apollo 11.

01 06 51 14 CC
Go ahead, 11.

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01 06 51 18 CMP
Oh, Charlie. That you?

01 06 51 20 CC
That's me. How are you there?

01 06 51 25 CMP
Oh, Just fine. How's the old White Team today?

01 06 51 27 CC
Oh, the old White Team's bright-eyed and bushytailed. We're ever alert down here.

01 06 51 33 CMP
Ever alert and ... Hey, you got any medics down there watching high grade? I'm trying to do some running in place down here, and I'm wondering just out of curiosity whether it brings my heart rate up.

01 06 51 44 CC
Well, they will spring into action here momentarily. Stand by.

01 06 52 12 CC
Hello, 11. We see your heart beating.

01 06 52 18 CMP
Okay, Well - look at the CDR's and the CMP's and see if they go up any. We're all running in place up here. You wouldn't believe it.

01 06 52 26 CC
I'd like to see that sight. Why don't you give us a TV picture of that one.

01 06 52 31 CMP
I think Buzz is trying. You got it.

01 06 52 36 CC
Okay. It's coming in at Goldstone, Buzz. As Bruce, said, we don't have it here in the center.

01 06 52 58 CMP
I'm afraid this isn't going to help out the PTC very much.

01 06 53 05 CMP
Yes. I don't know if it's a vibration or what it is, but it makes the pitch and yaw rate needles on FDAI number 1 jump up and down a little bit where we jump up and down.

01 06 53 19 CC
Roger. Goldstoners say they see you running there, Mike.

01 06 53 29 CMP
Okay.

01 06 53 31 CDR
Ask him what he's running from.

01 06 53 48 CC
11, Houston. Mike, we see about a 96 heartbeat now.

01 06 53 56 CMP
Okay. Thank you.

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01 06 54 27 CMP
Well, that's about all that is reasonable, without getting hot and sweaty.

01 06 54 32 CC
Roger. We copy.

01 06 58 00 CMP
Goldstone should be getting about the best picture of the Earth we can give them right now, Charlie.

01 06 58 03 CC
Roger, Mike. Thank you much.

01 06 58 07 LMP
We've got a tittle distortion in the horizontal direction from banding on our monitor. I wonder if they're getting the same thing?

01 06 58 27 CC
Stand by, Buzz. I'll let you know.

01 06 58 29 LMP
I guess it would be more described as a waviness.

01 06 58 51 CC
Goldstone M&O, Houston CAP COMM.

01 06 58 57 CT
Goldstone M&O.

01 06 58 58 CC
Okay. The crew is complaining of some horizontal banding on their monitor. Do you see that on the picture?

01 06 59 05 CT
Stand by.

01 06 59 14 LMP
They wouldn't see anything now. We don't have anything in focus, Charlie.

01 06 59 20 CC
Roger. He's checking on it. I'll see if they had it earlier. Stand by.

01 06 59 28 CMP
I guess when we're showing the DSKY or when we're showing the Earth might be the better time.

01 06 59 34 CC
Okay.

01 06 59 40 CT
Houston CAP COMM, Goldstone.

01 06 59 42 CC
Go ahead.

01 06 59 43 CT

Okay. Our TV people confirm they see this horizontal band.

01 06 59 46 CC

Okay.

01 06 59 51 CC

11, Houston. The Goldstone TV people also see the banding when - at the same time you do. Over.

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01 07 00 02 LMP

Okay. Would they call it a horizontal waviness, instead of banding, maybe?

01 07 00 06 CC

I'm not talking to them directly. Stand by, Buzz. Let me see how they describe it.

01 07 00 13 CC

Goldstone M&0, Houston CAP COMM. Could you put the TV guy on the loop, please?

01 07 00 19 CT

CAP COMM, Goldstone. Roger.

01 07 01 01 CT

Houston CAP COMM, Goldstone M&0 NET 1.

01 07 01 04 CC

Go.

01 07 01 05 CT

The TV people do not have access to NET 1 in that area. Suggest we use NET 2 For that purpose.

01 07 01 10 CC

Okay. Going to NET 2.

01 07 02 02 CC

Hello, Apollo 11. Houston. The Goldstone TV guys say they have some horizontal banding across the upper part of the picture and across the lower part. They would consider the lines just straight, no waviness to them at all. Over.

01 07 02 24 LMP

Roger. Understand. They do seem to distort vertical lines though.

01 07 02 30 CC

Say again about the vertical lines, Buzz.

01 07 02 35 LMP

Roger. When there's a vertical line, these horizontal bands tend to put small waves in it.

01 07 02 44 CC

Roger. I copy. He didn't mention that. Stand by, I'll check again.

01 07 03 30 CC

Hello, 11. Houston. The Goldstone TV said that when you get a sharp vertical line on the picture, when the horizontal banding goes across, it does appear to bend it slightly. The same as Apollo 10, they said. Looks okay to them. Over.

01 07 03 47 LMP

Okay. Understand. It's not our monitor. It must be the transmitter or the system.

01 07 03 52 CC

Roger. I guess so, Buzz. We'll have them look into it, and see if they can suggest anything.

01 07 05 12 CC

Hello, Apollo 11. Houston. We've lost our command interface with Goldstone. We'd like you to switch to OMNI Delta. Over.

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01 07 05 24 LMP

Roger. Going to Delta.

01 07 05 26 CC

Roger.

01 07 07 20 CC

Hello, Apollo 11. Houston. We'd like you to terminate the O2 purge if you have not done so already, and the TV camera people say that the lines are inherent in the camera, Buzz; and it's something that we expected. Over.

01 07 07 41 LMP

Roger. Understand about the camera. Say again about the O2 purge.

01 07 07 44 CC

Roger. We can terminate the O2 purge at this time. Over.

01 07 07 50 LMP

Oh, okay. Fine. Will do.

01 07 13 18 CC

Hello, Apollo 11. Houston. Please select OMNI Bravo on board. Over.

01 07 13 26 CMP

Okay. Going to Bravo, Charlie.

01 07 13 28 CC

Roger.

01 07 13 32 CMP

How's everything going down there? You guys happy with the spacecraft systems?

01 07 13 37 CC

Roger. Affirmative. Everything's looking really good to us. Over.

01 07 13 44 CMP

Okay. Same here.

01 07 14 23 CMP

Charlie, how far out can you pick up TV off the OMNI?

01 07 14 27 CC

Stand by.

01 07 14 47 CC

Hello, Apollo 11. Houston. We're just about to the limits where we can get any kind of picture at all on the OMNI's on the TV. It - The picture, I guess, would be just almost zero at this point.

01 07 15 02 CMP

Okay. Well, for this TV program coming up in a couple of hours, you might give some thought to how you want us to stop PTC, if you do, for the best high gain angle; and also it would be nice if you could stop us at such an attitude that we'd have the Earth out of one of our windows.

01 07 15 21 CC

Roger, 11. We're thinking about that.

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01 07 15 25 CMP

Okay.

01 07 18 48 CC

Hello, Apollo 11. Houston. We got some PIPA biases and general drift updates for you if you give us P00 and ACCEPT. Over.

01 07 19 01 CDR

Okay, Charlie. Stand by one.

01 07 19 04 CC

Roger, 11. The - -

01 07 19 05 CDR

You've got it.

01 07 19 07 CC

Okay. Thank you much. Our biggest drift on the GYRO's is 0.03 degrees per hour with - on the X-GYRO. On the PIPA's, the Y-PIPA's the biggest and it's 0.006 feet per second so ... trying to tweak it up. The biggest we have is about one sigma on both GYRO's and accelerometers.

01 07 19 33 CDR

Sounds good.

01 07 19 37 CC

The system really looks good to us.

01 07 19 42 CDR

Glad to hear it, Charlie.

01 07 20 31 CC

11, Houston. You can go back to BLOCK. We've got the load in.

01 07 20 38 CDR

Okay. Roger.

END OF TAPE

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01 07 22 25 LMP

Boy, you sure get a different perspective in this thing in zero g. Right now, Neil's got his feet on the forward hatch, and he can with his arms reach - all five windows, He can reach down into - the LEB where the overboard drain is. He can practically reach over in the cockpit.

01 07 22 33 CC

Sounds like Plastic Man to me.

01 07 23 00 CMP

I'm hiding under the left-hand couch trying to stay out of his way.

01 07 23 04 CC

Be a good idea, Mike.

01 07 25 18 LMP

Houston, Apollo 11. You got a cloud over the Houston area right now?

01 07 25 24 CC

Roger. We just had a really big thunderstorm here about a hour ago. Couple of storms around the area ... Over.

01 07 25 28 LMP

Yes. I see one fairly large and isolated one. There are couple of more off to the left, but this one looks fairly good size. It could very well be the one that just passed over you.

01 07 25 33 CC

Roger.

01 07 25 34 LMP

Yes, and it looks like the Cape has been having a little bit of rain, too.

01 07 25 47 CC

Roger. The one we had here came in from the west and is moving east - or nearly so, as far as I could tell.

01 07 25 59 LMP

That view through this sextant is fantastic. I can see Alaska right up - right up along the LM, and I'm running the crosshairs right now down the coast of California, the west coast of Mexico, Yucatan Peninsula, up around the Gulf, Florida, Cuba, down Central America, and I'm running into the stop right now, on the sextant.

01 07 26 44 CC

Roger. It sounds like a pretty fantastic view.

01 07 26 51 LMP

The guys in the weather office at Patrick wanted a report on the tops but I guess all we can say is we're above them.

01 07 26 58 CC

Roger. We'll pass it on to METRO.

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01 07 27 09 CC

11, Houston. Do you see any predominant weather systems as far as frontal type or any buildup of tropical-storm type? Over.

01 07 27 25 LMP

Not any large ones. There are a couple of smaller disturbances. Well, there's one maybe 300 miles north of Cuba, but it doesn't look cyclonic.

01 07 27 39 CC

Roger.

01 08 24 58 CC

Hello, Apollo 11. Houston. We got a TV attitude for you and also an update to your CMC erasable load and your alternate contingency checklist, if you could break that out too. Over.

01 08 25 16 LMP

Roger. I'm not sure I caught all of that. Go ahead with what you have.

01 08 25 23 CC

Roger, 11. If you'll break out your alternate and contingency checklist for the CSM, we got an update to some of the erasable loads on page F2-20, Over.

01 08 25 42 LMP

Okay. Be getting that out, and you can give us the attitude for TV.

01 08 25 48 CC

Roger, 11. Your TV attitude will be roll 261, pitch 090, yaw 000. High gain angle: pitch plus 28, yaw 271. That puts the left-hand window pointed at the Earth. We recommend exiting PTC with your updated procedure in the checklist. Over.

01 08 26 29 LMP

Roger. We copy roll 21 - 61, pitch 090, yaw 000, high gain pitch plus 28, yaw 271. And we'll like this with the DELTA-V that we have in the book. Over.

01 08 26 46 CC

That's affirmative.

01 08 27 01 CMP

Charlie, Apollo 11. I have a couple of questions on stopping the PTC. It seems to me the easiest way to stop it would be - we're essentially, of course, at 0 degrees yaw and closing up to 90 degrees pitch, so it's just a question of stopping at 260 roll, roughly, and - How about for a procedure going MANUAL ATTITUDE, three to RATE COMMAND and then, seeing as how our deadband has already collapsed, I'll turn on the panel 8 RCS thrusters, at which time it should stop at whatever attitude it finds itself in. And if I do all of that as it comes up on 261 degrees roll, we should stop right there. Is that sufficient?

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01 08 27 46 CC

Sounds pretty good. Stand by one.

01 08 27 50 CMP

Sounds like it might save a little gas.

01 08 29 06 LMP

Houston, Apollo 11. What page do you want in that revision? Over.

01 08 29 11 CC

Roger, 11. If you'll turn to page F2-20. Over.

01 08 29 28 LMP

Okay, Tim -

01 08 29 32 CC

Roger, 11. Under column A on page F2-20, line 5, line 05, the new data is 01042; line 07, the new data is 00256. Skipping down to line 11, 00070; line 12 is 00042; line 13 is 77730. In column Bravo, lines 3, 4, and 5, which are blank, should be all zeros for line 3; line 4 is 20017; line 5 20616. Over.

01 08 31 10 LMP

Roger. Page F2-20, column Alfa: 05, 01042; 07, 00256; 11, I'll say again. 11, 00070; 12, 00042; 13, 77730. Column Bravo: 03, 00000; 04, 20017; 05, 20616. Over.

01 08 32 09 CC

Roger. Good readback, Buzz. And stand by, Mike, on the coming-out-of-the-PTC recommendation. Over.

01 08 32 17 CMP

Okay. Fine.

01 08 33 06 CC

Hello, Apollo 11. Houston with a recommendation on exiting PTCM. Over.

01 08 33 13 CMP

Go ahead.

01 08 33 14 CC

Roger, Mike. We'd like to see you go to ACCEL COMMAND on the MANUAL ATTITUDE switches. Then to turn on the AUTO RCS SELECT switches, and then go RATE COMMAND. That will prevent us from firing jets uncoupled. Over.

01 08 33 36 CMP

Okay. Fine. And I would guess go RATE COMMAND and roll first and then followed by pitch and yaw.

01 08 33 45 CC

Okay. That sounds good if - And when you get to the roll attitude desired, just go RATE COMMAND at that time and it'll stop us right on.

01 08 33 58 CMP

Yes. I agree, Charlie. That sounds right.

01 08 34 00 CC

Roger.

01 08 39 11 CC

Hello, Apollo 11. Houston with some more words on exiting PTC. Over.

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01 08 39 18 CMP

Go ahead, Charlie.

01 08 39 20 CC

Roger. Mike, when you were playing with the P37 a while ago and we collapsed the deadband back down, the DAP assumed that the deadband was centered around the new attitude that we happened to be at, at that time. Since then, we've drifted out a couple of degrees in both pitch and yaw from that attitude such that if we did the procedure as we called it up to you of going ACCEL COMMAND, turning on all of the AUTO RCS SELECT switches and then RATE COMMAND, it would attempt to fly back to the pitch and yaw attitude that it had when the deadband collapsed. We can prevent that by - just immediately prior to going to RATE COMMAND on the MANUAL ATTITUDE switches, if you cycle the SPACECRAFT CONTROL switch to SCS, then back to CMC. Over.

01 08 40 13 CMP

Sounds like a winner.

01 08 40 14 CC

Okay.

01 08 40 33 CMP

I'm not going to let these LM guys play with my DSKY anymore.

01 08 40 38 CC

You sound like you'd better protect it. It looks like just about anything that you do with that DSKY is going to collapse that deadband back down.

01 03 40 49 CMP

Understand.

01 08 43 14 CMP

Charlie, we just STABED to 261 degrees roll, and it looks like whoever figured it out did a good job. It's right there, dab-smack in the middle of window number 1.

01 08 43 23 CC

Sounds great.

01 08 46 00 LMP

Looks like Houston's still got a little smog over it, Charlie.

01 08 46 04 CC

We've got a constant overcast here in the room. We'll be right there. Stand by.

01 08 46 08 LMP

Of course, a little cloud from up here probably covers 8 or 10 states.

01 08 46 31 CC

11, Houston. Some of our guys just came in from outside and said it's pretty clear over the center here. It's cleared up completely. All the storms have moved on.

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01 08 46 42 LMP

Very good.

01 08 49 17 LMP

Oh, yes, Charlie. I can see it through the sextant now, and I can see the coastline is clear. Those clouds are just inland a few miles.

01 08 49 26 CC

Okay. We copy.

01 08 49 49 LMP

Looks like the southeast part of the country is all socked in.

01 08 50 04 LMP

California looks nice. The San Joaquin Valley shows up as a real dark spot with a lighter brown on either side of it. You can't tell that it's green. It looks just sort of dark gray or maybe even real dark blue.

01 08 50 16 CC

How does the Mojave look? Is it clear?

01 08 50 26 LMP

Yes. As usual.

01 08 50 28 CC

Roger. The - around -

01 08 50 29 LMP

It looks like there's some clouds just to the west of the Sierras, northeast of Bakersfield a little bit; and crossing over into the Mojave from Bakersfield looks clear; and then as you get on further to the southeast of there, there's a few clouds.

01 08 50 48 CC

Roger, 11. Can you pick out Edwards in the sextant? Over.

01 08 50 58 LMP

I can see a 104 taxiing out for takeoff on the runway.

01 08 51 03 CC

Hey, man. That's super.

01 08 51 07 LMP

These dang bastards almost always have a 104 taxiing out for takeoff.

01 08 51 48 CC

11, Houston. Could you pick out anything around Edwards, a dry lake or anything? Over.

01 08 51 56 LMP

Negative, Charlie. I just - I don't have that resolution. But to give you some idea, I can - on the lower Texas coast, I can see - knowing what I'm looking for, I can see Padre Island. I can just barely make out the fact that there's a thin spit of land and then there's a little dark zone which is the Laguna Madre between it and the mainland.

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01 08 52 22 CC

Roger, 11. That's pretty significant. Thank you much, Buzz.

01 08 52 27 LMP

Right.

01 08 52 39 LMP

How far out are we, Charlie?

01 08 52 41 CC

Stand by. I'll give it to you exactly. Looks like around 130,000, but stand by.

01 08 52 47 LMP

Okay.

01 08 53 16 CC

11, Houston. The exact range is 125,200 miles, and you're traveling 4486 feet per second.

01 08 53 29 LMP

Pretty far and pretty slow. Just past halfway.

01 08 53 48 LMP

Hey, Charlie, what the latest on Luna 15?

01 08 53 53 CC

Say again, Buzz? Over.

01 08 53 58 LMP

Roger. What's the latest on Luna 15?

01 08 54 02 CC

Stand by. I'll get the straight story for you.

END OF TAPE

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01 09 37 44 CC

Hello, Apollo 11. Houston. Over.

01 09 37 48 CMP

Go ahead, Charlie.

01 09 37 50 CC

Roger. Latest on Luna 15 - TASS reported this morning that the spacecraft was placed in orbit close to the lunar surface, and everything seems to be functioning normally on the vehicle. Sir Bernard Lovell said the craft appears to be in an orbit of about 62 nautical miles. Over.

01 09 38 17 CMP

Okay. Thank you, Charlie.

01 09 38 20 CC

And also, President Nixon has reported - or declared a day of participation on Monday for all federal employees to enable everybody to follow your activities on the surface. Many state and city governments and businesses throughout the country are also giving their employees the day off, so it looks like you're going to have a pretty large audience for the EVA.

01 09 38 46 CMP

Oh, that's very nice, Charlie. I'll tell Neil about it.

01 09 47 57 CDR

Houston, Apollo 11. We've stopped PTC. We're in the right position; we're setting up for TV.

01 09 48 02 CC

Roger.

01 09 52 31 CC

Apollo 11, Houston. We have you stopped in the PTC; attitude looks good to us. Mike, I would like to get a COMM check. The last couple of the transmissions from the spacecraft has been garbled from especially Buzz. Could you both give me a COMM check? Over.

01 09 52 51 LMP

Roger, Charlie. Buzz here. How do you read? 1, 2, 3, 4, 5; 5, 4, 3, 2, 1.

01 09 52 56 CC

Roger. You are about four-by with a slight decrease/increase in volume, sort of a wavy volume to it. Over.

01 09 53 09 LMP

Okay. I moved my mike around. How about now? Is this any better?

01 09 53 12 CC

Hey, that's beautiful right there. Thank you.

01 09 53 17 CMP

Okay, Charlie. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. How do you read me?

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01 09 53 21 CC

Roger. You're five-by. Is Neil on?

01 09 53 25 CDR

1, 2, 3, 4, 5; 5, 4, 3, 2, 1.

01 09 53 27 CC

Roger, Neil. You're five-by.

01 09 59 11 CC

Hello, Apollo 11. Houston. We got the network all configured for the TV. You can start any time you want. Over.

01 09 59 45 CC

Okay, 11. We have a picture. We see the Earth right in the center of the screen. Over.

01 09 59 52 CDR

Roger, Houston. Apollo 11 calling in from about 130,000 miles out. And we'll zoom our camera in slowly and get the most magnification we can. Over.

01 10 00 06 CC

Roger.

01 10 01 16 CC

11, Houston. The definition is pretty good on our monitor here. The color is not too ..., at least on this set. Could you describe what you're looking at? Over.

01 10 01 31 CDR

Roger. You're seeing Earth, as we see it, out our left-hand window, just a little more than a half Earth. We're looking at the eastern Pacific Ocean, and the north half of the top half of the screen, we can see North America, Alaska, United States, Canada, Mexico, and Central America. South America becomes invisible just off beyond the terminator or inside the shadow. We can see the oceans with a definite blue cast, see white bands of major cloud formations across the Earth, and can see coastlines, pick out the western U.S., San Joaquin Valley, the Sierra mountain range, the peninsula of Baja California, and we can see some cloud formations over southeastern U.S. There's one definite mild storm southwest of Alaska, looks like about 500 to 1000 miles, and another very minor storm showing the south end of the screen near the - or a long ways off of the equator, probably 45 degrees or more south latitude. Can pick out the browns in the landforms pretty well. Greens do not show up very well. Some greens showing along the northeastern - northwestern coast of the United States and northwestern coast of Canada.

01 10 03 44 CC

Roger, 11. It's a pretty good picture on clarity here. We're having - can you tell us - It appears to us that there are two distinct cloud- formations

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trending east/west, one approximately about along the equator, and one around 30 or so south latitude. Could you tell us exactly where those cross the landmasses? Over.

01 10 04 13 CDR

Yes. They cross just south of the lower part of Mexico, probably through Central America. That is the equatorial band which we assume to be the intertropical convergence zone. The other band, which stands about 30 south, correctly appears to join the equator at the far left, or just beyond the horizon on the left edge of Earth, or at least it looks like it's going to join it. We don't have an explanation for that banding.

01 10 04 53 CC

Roger, Neil. Thank you. It also appears that just to the left of the terminator, up in the northern hemisphere, there's a cloudband trending - a gap in the cloud, trending northwest/southeast. It appears to us that that comes in about over the northern United States, or perhaps the central United States. Is that about correct? Over.

01 10 05 26 CDR

I can see on the monitor the thing you were talking about, but right now I can't get my eye to the window to pick out just where it crosses the shoreline.

01 10 05 35 CC

Roger.

01 10 05 42 CC

You guys are doing a good job. It's a real steady picture, here. We're - Clarity is excellent. The color, it's - the clouds are - The whites are distinct. The rest if it looks like, to me anyway on the monitor I'm observing, is a fairly greenish blue is the way I'd describe it. Over.

01 10 06 09 CC

It appears that the - -

01 10 06 11 CDR

Well, we can't observe much green from the spacecraft.

01 10 06 18 CC

Roger. On this monitor, the landmasses appear to be just a darker grayish color rather than a brown.

01 10 06 31 CDR

Well, it's true that we do not have the depths of color at this range that we enjoyed at 50,000 miles out. However, the oceans still are a definite blue and the continents are generally brownish in cast,

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although it is true that they're tending more toward gray now than they were at the closer range.

01 10 07 03 CC

Roger, 11. We've been - I've just been vectored to another monitor and sure enough, the browns are coming in a lot more distinctly on the Eidephor that we have up on our screen in the control center. Over.

01 10 07 21 CDR

Okay, world, hold on to your hat. I'm going to turn you upside-down.

01 10 07 50 CC

11, that's a pretty good roll, there.

01 10 08 03 CDR

Oh, I'd say sloppy, Charlie. Let me try that one again.

01 10 08 12 CC

You'll never beat out the thunderbird.

01 10 08 37 CC

Apollo 11, Houston. That practice did you some good. It's looking - real smooth roll, there.

01 10 08 43 CC

Oops! Spoke too soon.

01 10 08 53 CDR

I'm making myself seasick doing it, Charlie. I'll just put you back rightside-up where you belong.

01 10 08 58 CC

Roger.

01 10 09 01 CDR

You don't get to do that every day.

01 10 09 32 CC

11, Houston. Could you describe, from your view, the polar cloudcap? It appears to us to extend down the western coast of North America. Would you estimate how far it extends down? Over.

01 10 09 47 LMP

Trying to fit everybody into the window.

01 10 09 50 CDR

It appears that the cloudcap comes down a little bit below the southern extremity of Alaska.

01 10 10 03 CC

Roger.

01 10 10 11 CC

We've - 11, we've lost our picture here, now.

01 10 10 24 CC

Okay. Apollo 11, Houston. We've got the picture back now.

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01 10 10 36 CDR

Unfortunately, we only have one window that has a view of the Earth and it's filled up with the TV camera, so your view now is probably better than ours is.

01 10 10 47 CC

Roger. We copy.

01 10 10 51 CC

11, Houston. If you could comply, we'd like to see a little smiling faces up there, if you could give us some interior views. I'm sure everybody would like to see you. Over.

01 10 11 06 CDR

Okay. We'll reconfigure the TV for that.

01 10 11 08 CC

Roger.

01 10 12 31 CC

Apollo 11, Houston. It appears to us that we're seeing a view from outside plus a little of the inside. It appears you've taken the camera away from the left window now. Over.

01 10 12 45 CDR

That's correct. We're moving it back and reconfiguring for interior lighting.

01 10 12 50 CC

Roger.

01 10 12 56 CC

We can still see the Earth through the left window, and it appears that we can see a floodlight off to the left, either that or some Sun shafting through the hatch window.

01 10 13 10 CDR

It's a floodlight.

01 10 13 11 CC

Roger.

01 10 13 14 CC

Now we're coming in. Can't quite make out who that ...

01 10 13 24 CC

That's big Mike Collins, there - -

01 10 13 25 CMP

You got a little bit of - Yes, hello there sports fans. You got a little bit of me, plus Neil is in the center couch, and Buzz is doing the camera work at this time.

01 10 13 34 CC

Roger. It's a little dark now, 11. Maybe a bigger f-stop might help.

01 10 13 44 CMP

Yes, that's in work.

01 10 14 05 CC

It's getting a lot better now, 11. Mike, you're coming in five-by. I got a good -

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01 10 14 14 CMP

I would have put on a coat and tie if I'd known about this ahead of time.

01 10 14 18 CC

Is Buzz holding your cue cards for you. Over.

01 10 14 25 CMP

Cue cards have a no. We have no intentions of competing with the professionals, believe me. We are very comfortable up here, though. We do have a happy home. There's plenty of room for the three of us and I think we're all learning to find our favorite little corner to sit in. Zero g is very comfortable, but after a while you get to the point where you sort of get tired of rattling around and banging off the ceiling and the floor and the side, so you tend to find a little corner somewhere and put your knees up or something like that to wedge yourself in, and that seems more at home.

01 10 15 05 CC

Roger. Looks like Neil is coming in five-by there, 11. Mike, see you in the background. The definition is really outstanding. The colors are good. It's a real good picture we're getting here of Commander Armstrong. We - Buzz, when you take the camera over towards the window where the Sun's shafting through, it tends to blank it out, though.

01 10 15 35 CMP

Yes, Neil's standing on his head again. He's trying to make me nervous.

01 10 15 40 CC

Roger.

01 10 15 50 CMP

He's disappearing up into the tunnel, of course, as he would going into the lunar module, only backwards.

01 10 15 57 CC

Roger. We 'can see portions of the LEB now. The systems test meter panel, in the lower part of the picture, or we did have it, anyway.

01 10 16 09 CMP

Okay. And directly behind his head are our optical instruments, the sextant and the telescope that we use to take sightings with.

01 10 16 19 CC

Roger. Copy. And we see the DSKY flashing with a 651. In fact, we can read registers 1 and 2 quite clearly.

01 10 16 31 CMP

We have the old high gain angles telling us which way the Earth is.

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01 10 16 35 CC

Copy. That's a beautiful picture. Clarity is outstanding.

01 10 16 47 CMP

We can also give you the time of day in our system of mission elapsed time. Elapsed time: 34 hours 16 minutes and umpteen seconds. Can you see that clearly enough, Charlie?

01 10 16 59 CC

Roger, Apollo 11. We can see it counting up every - every second. We got 34 17 02 now.

01 10 17 13 CMP

Okay. Back to the high-gain angles.

01 10 17 15 CC

Roger.

01 10 17 18 CMP

Now we have amputated those.

01 10 17 45 CC

11, Houston. We have a beautiful rainbow there now as you move the camera around. ... That looks like the star charts coming into view, now. Over.

01 10 17 58 CMP

Yes. Those are Buzz's two star charts that he is using right now as sun shades over the righthand window, window number 5.

01 10 18 07 CC

Roger. We see the sun shining in through it behind him and plotting out the equatorial - correction, ecliptic plane, and the stars that you're using for the navigation.

01 10 18 20 CMP

Roger. He doesn't really need the charts. He's got them memorized. They're just for show.

01 10 18 27 CC

We copy.

01 10 18 28 LMP

While we're pointing up in this direction, we see out our side windows the Sun going by and, of course, out one of our windows right now we've got the Earth. Now right behind my window, of course, we have the Sun, because the Sun is illuminating the star charts that we see. This line represents the ecliptic plane and these lines, vertical lines, represent our reference system that the spacecraft is using at this time. As we approach the Moon, the Moon will gradually grow larger and larger in size and eventually it will

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be in - it will be eclipsing the Sun as we go behind it, as we approach the lunar orbit insertion maneuver.

01 10 19 19 CC

Roger, 11. We've - Could you attempt a little bit better focus there, 11? Over.

01 10 20 01 CC

11, Houston. That's a lot better on the star chart now. We can make out the ecliptic plane and the planets and the Sun and the Moon as they have gone at various places throughout the ecliptic plane. Over.

01 10 20 19 CMP

Okay, Charlie.

01 10 20 41 LMP

If we can get some of the wires untangled here, we'll give you a demonstration of how easy pushups are up here.

01 10 20 52 CC

11, Roger. Good view of Buzz, there.

01 10 21 24 LMP

When it gets pretty hard doing it that way, we just roll over and do it the other way.

01 10 21 30 CC

Roger. We copy. We couldn't figure out whether that was a chinup or a pushup. just take your choice, I guess.

01 10 22 05 CMP

Well, it looks like it's probably almost your dinner time down there, Earth. We'll show you our food cabinet here in a second.

01 10 22 14 CC

11, Roger.

01 10 22 38 CC

11, Houston. We see a box full of goodies there. Over.

01 10 22 43 CMP

We really have them, Charlie. We've got all kinds of good stuff. We've got coffee up here in the upper left and various breakfast items, bacon in little small bites, beverages like fruit drink, and over in the center part we have, oh, all kinds of things. Let me pull one out here and see what it is.

01 10 23 04 CC

Roger.

01 10 23 11 CMP

Would you believe you're looking at chicken stew, here? All you have to do is - 3 ounces of hot water for 5 or 10 minutes. Now we get our hot water out of a little spigot up here with a

Tape 22/9 — Page 115

filter on it that filters any gases that may be in the drinking water out, and we just stick the end of this little tube in the end of the spigot and pull the trigger three times for 3 ounces of hot water and then mush it up and slice the end off it and there you go, beautiful chicken stew.

01 10 23 46 CC

Sounds delicious.

01 10 23 56 CMP

Yes. The food so far has been very good. We couldn't be happier with it.

01 10 24 00 CC

Roger.

01 10 24 01 CMP

Could I borrow that flashlight a second?

01 10 24 05 CC

The surgeons are saying thank you, there, for that.

01 10 24 10 CMP

And it is sort of down in a dark corner, so we have a flashlight here to help us see things; and if I can let go of it carefully, it'll just hold itself right where it is.

01 10 24 24 CC

Roger.

01 10 24 25 CMP

As long as it's ..., it will.

01 10 24 36 CC

Apollo 11, Houston. That's a pretty good demonstration. You started off really stable there, Mike. It's -

01 10 24 44 CMP

Well, the problem is, no matter how carefully you let go, you bump it just a tiny little bit and set it in motion, and once in motion there she goes. Try that again.

01 10 25 00 CC

It looks fairly stable now with slow rotation.

01 10 25 29 CMP

Well, so much for the food department. I'm going to close up the store down here.

01 10 25 33 CC

Roger. We copy.

01 10 25 39 LMP

Charlie, we checked out the cable lengths, and we're thinking we might want to see if we can take the TV into the LM with us tomorrow for part of the time. Over.

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01 10 25 49 CC

Roger. Good show. We'd like to see it if it'll reach that far. Over.

01 10 25 57 LMP

We'll give it a try.

01 10 25 59 CC

Roger.

01 10 26 31 CMP

And where we sleep is down underneath this couch.

01 10 26 37 CC

Houston. Roger.

01 10 26 42 CC

Slowly sinking into the sack there.

01 10 26 51 CMP

It's really comfortable.

01 10 27 01 CMP

Forgot to give Buzz his flashlight back.

01 10 27 22 CC

Apollo 11, Houston. Could you give the folks a view of your patch on your CWG's? Over.

01 10 27 37 CMP

Stand by one, Charlie; we'll try and give you a closeup.

01 10 27 40 CC

Roger.

01 10 27 52 CC

11, Houston. We have the patch. Could you attempt to improve the focus slightly? Over.

01 10 28 13 CC

11, Houston. The scan on the camera makes the - that's a little bit better now. The flashlight seems to flicker, due to the scan on the TV. We can't see the eagle. Now it's a little bit better. Over. Could you open the f-stop a little bit more? Over.

01 10 28 41 CMP

It's open all the way. We're going to have to move Buzz around a little bit.

01 10 28 44 CC

Roger.

01 10 29 23 CC

Apollo 11, Houston. The color is better now. It's coming in. We could attempt a little bit better focus on it. There we go; it focuses a lot better now. We see the eagle coming right in on the lunar surface. Over. That's very good now.

01 10 29 56 CC

Apollo 11, Houston. That's very good now. We can see the Earth in the background, Apollo 11, and the eagle coming in.

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01 10 30 05 CMP

It's probably pretty hard to see the olive branch, isn't it?

01 10 30 08 CC

Roger. It is.

01 10 30 12 CMP

Well, that's what he has in his talons, is an olive branch.

01 10 30 16 CC

Copy.

01 10 30 39 CC

Apollo 11, Houston. We're really impressed with the clarity and the detail that we have in the picture. The colors are - now, it's really an excellent picture now that I'm looking at it on our monitor, which is about 12 seconds before the networks can get it out due to the conversion that we have here on our TV converter. We're looking at the controls in the main display console. We can see the DSKY up on the panel. Over.

01 10 31 32 CMP

That would be nice if you could take a look at all the circuit breakers; make sure the right ones are in and the right ones are out.

01 10 31 38 CC

Roger. Big Bubba's watching.

01 10 31 43 CMP

And we're glad of it.

01 10 31 53 CMP

Boy, you guys have sure been doing a good job of watching us, Charlie. We appreciate it.

END OF TAPE

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01 10 32 00 CC

The spacecraft's been beautiful, 11. We've really no complaints at all. Looks - Things are really great.

01 10 32 12 CMP

Can you see this DSKY on the MDC?

01 10 32 15 CC

That's affirmative. It appears that - can't quite tell what program ... went P00. We see you punching in a VERB 35, I think it is. Over.

01 10 32 28 CMP

Yes. Might as well tell the EECOMM's - or tell the GNC and everybody to hold on to their hat and I'll push the EKTER button.

01 10 32 36 CC

Roger.

01 10 32 51 CC

Roger. We see a real display now.

01 10 32 56 CC

That's a good demonstration of how the crew has the interface with the computer, talking to the programs and all that we have in the computer.

01 10 33 09 CMP

Well, that's right, Charlie. Sometimes it tells us things and sometimes we tell it things and mostly it talks to us.

01 10 34 14 CC

11, Houston, We just lost our pic - I see we're going back outside now. Over.

01 10 34 29 SC

...

01 10 34 31 CC

11, Houston. We copy. Over.

01 10 34 35 CDR

Roger. We copy, and as we pan back out to the distance at which we see the Earth, well, it's Apollo 11 signing off.

01 10 34 50 CC

Roger, Apollo 11. Thank you much for the show. It's a real good half hour. Appreciate it. Thank you very much. Out.

01 10 35 22 CMP

Okay. That's it, Cnarlie.

01 10 35 24 CC

11, Houston. We appreciate the show. Thank you very much. Over.

01 10 35 29 CMP

Right.

01 10 35 49 CC

Apollo 11, Houston. Would you key ERROR RESET on the DSKY, please? Over.

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01 10 36 00 CDR

Okay. We should be straightened out now, Charlie, and back in P00.

01 10 36 43 CMP

Houston, Apollo 11. How do we stand on this O2 fuel cell purge? You want to go ahead and do that as scheduled in the flight plan?

01 10 36 51 CC

Stand by, 11. Over.

01 10 36 54 CMP

Okay.

01 10 36 58 CC

11, Houston. You can commence the O2 fuel cell purge now if you'd like. Over.

01 10 37 04 CMP

Okay. Fine.

01 10 37 13 CMP

While Buzz is doing that, I'll change the lithium hydroxide.

01 10 37 16 CC

Roger.

01 10 41 42 CC

Hello, Apollo 11, Houston. Over.

01 10 41 47 LMP

Go ahead, Houston. Apollo 11.

01 10 41 49 CC

Roger, Buzz. The attitude that we're in right now is a convenient one to start PTC in. We'd be satisfied with this attitude. So we'd like you to disable quads Charlie and Delta; and we'll wait about 5 to 10 minutes, and then we'll establish the PTC. Over.

01 10 42 10 LMP

Roger. Disable Charlie and Delta, and we'll wait before starting PTC.

01 10 42 16 CC

Roger.

01 10 53 17 CC

Hello, Apollo 11, Houston. The rates are damped out well enough for you to initiate the PTC now. Over.

01 10 53 26 LMP

Okay. We'll get it going.

01 10 59 58 CMP

Houston, Apollo 11.

01 11 00 03 CC

Roger. Go ahead.

01 11 00 09 CMP

Roger. This time the DAP didn't like 0.3. It's - We followed the procedures; we got down to 70 000 ENTER. It took off at about 0.7.

01 11 00 21 CC
Roger. We're copying that. Stand by.

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01 11 00 39 LMP
Houston, Apollo 11. Would you like high gain back?

01 11 00 43 CC
Roger. And you - Would you select ATTITUDE HOLD? Over.

01 11 01 09 CDR
Houston. Would you say again what your request is?

01 11 01 15 CC
Roger, 11. We'd like you to go back to ATTITUDE HOLD. Over.

01 11 01 22 CDR
Roger.

01 11 01 24 CC
11, Houston. Looks like we're going to have to reinitialate - reinitialize this PTC.

01 11 01 31 CDR
All right.

01 11 01 41 CMP
Okay. Do you have any roll angle that you'd like to stop it in, Charlie? I haven't stopped it yet.

01 11 01 48 CC
Stand by.

01 11 01 55 CC
11, Houston. It's your preference. Right now if you want to. Over.

01 11 02 03 CMP
Okay.

01 11 07 47 CC
Apollo 11, Houston. Over.

01 11 07 52 LMP
Houston, Apollo 11.

01 11 07 53 CC
Roger, 11. The problem on that initially - starting up the PTC was we failed to do the VERB 49 which - and load the desired initial attitude; so the DAP tried to take it back to the old attitude that we had started up in number of hours to go. That's why we picked up the rates in the other axes. We're going to wait in this attitude for about 20 minutes to dump out the rates again, and then we'll proceed with the VERB 49 and load our attitude that we have at the time - at this time. Over.

01 11 08 37 CMP
Okay. That sounds good, Charlie. When you get to the VERB 49, I'd like for you to give me the three gimbal angles that you want loaded.

01 11 08 44 CC
Roger. We'll do. Over.

01 11 08 48 CMP
Thank you.

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01 11 08 50 CC

And Apollo 11, Houston. We have your flyby PAD if you're ready to copy. Over.

01 11 08 56 CMP

Stand by one.

01 11 09 31 LMP

Houston, Apollo 11. Is that P30 PAD?

01 11 09 34 CC

That's affirmative. Over.

01 11 09 41 LMP

Okay. Ready to copy.

01 11 09 42 CC

All right, Buzz. It's - flyby is the purpose. SPS/G&N: 62815, plus 097, minus 020 070 54 5944, minus 00028, plus 00023, plus 00069 029 149 312, apogee is NA, plus 00221 00078 001 00034, sextant star 01 2385 227, boresight star is NA NA NA. Latitude is minus 0265, minus 16500, 11899 36228, 144 56 47. In the comments: your set stars are Deneb and Vega, 007 144 068. No ullage. It's a docked burn using the PTC REFSMMAT. Stand by for your readback. Over.

01 11 12 41 LMP

Okay. Would you give me GET of O.05g again, please?

01 11 12 44 CC

Roger. 144 56 47. Over.

01 11 12 58 LMP

Roger. Flyby SPS/G&N: 62815, plus 097, minus 020 070 54 5944, minus 00028, plus 00023, plus 00069, 269 149 312 NA, plus 00221 00078 001 00034, 01 2185 227 NA, minus 0265, minus 16500 11899 36228 144 56 47, Deneb and Vega, 007 144 068. No ullage; docked, PTC REFSMMAT. Over.

01 11 14 12 CC

Roger. Say again your roll angle, Buzz. I copy - I read 029. Over.

01 11 14 20 LMP

Roger. 029.

01 11 14 22 CC

Roger. Good readback.

01 11 14 38 CMP

Houston, Apollo 11. On the 0.7 rate, the rate loaded into the DAP is 0.1 or 0.2.

01 11 14 48 CC

11, Roger.

01 11 17 46 CC

Hello, Apollo 11. Houston. Over.

01 11 17 51 CMP

Houston, Apollo 11. Go.

01 11 17 53 CC

Roger, Mike. Would you please copy down your VERB 16 NOUN 20 ICDU angles now, then execute a VERB 49 and load that - those angles, the NOUN 20

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that you see on the DSKY into the VERB - into the NOUN 22 slot; and PRO on that, and that will start our 20-minute rate period. Over.

01 11 18 18 CMP

Okay, Charlie. I'll do that right now in just a matter of inches. Those numbers are plus 04511, plus 09021, and plus 35984. Over.

01 11 18 31 CC

Roger.

01 11 20 13 CMP

Houston, Apollo 11. I've done that and, of course, I got an immediate 50 18. So I guess we're set up to proceed from here, and I'll start the 20-minute timer.

01 11 20 21 CC

That's affirmative.

01 11 20 44 CMP

Houston. I still question that 0.7 rate with 0.2 loaded into the DAP, though. Could you explain that one?

01 11 20 50 CC

Roger. We're working on it.

01 11 20 54 CMP

Okay.

01 11 25 42 CC

Apollo 11, Houston. Over.

01 11 25 48 CMP

Houston, Apollo 11.

01 11 25 49 CC

Roger. We got a little laser visual experiment we'd like to - for you to do for us. If - if you got the Earth through any of your windows or through the telescope, would you so advise? Over.

01 11 26 09 CMP

Stand by one, Charlie.

01 11 26 15 CMP

At this roll attitude, what should our highgain angles be? Maybe that would help us locate you. We don't see you in the lens.

01 11 26 23 CC

Stand by.

01 11 27 27 CC

Hello, Apollo 11. Houston. Those high gain angles are pitch minus 70, yaw 90. We think the Earth is apparently pretty close to plus z-axis. Over.

01 11 27 40 CMP

Okay.

01 11 28 00 CMP

Okay, Charlie. I got you in the telescope.

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01 11 28 08 CC

Roger, Apollo 11. We've got a laser that we're going to - It's a blue-green laser that we're going to flash on and off at a frequency of on for a second, off for a second. It's coming out of McDonald Observatory near El Paso, which is - should be right on the terminator - or right inside the terminator. We are going to activate that momentarily. Would you please take a look through the telescope and see if you can see it. Over.

01 11 28 42 CMP

Telescope? Or sextant?

01 11 28 45 CC

Either one. Over.

01 11 28 49 CMP

Okay, I'll try it with the telescope; and if I don't see it there, then I'll try the sextant.

01 11 28 53 CC

Roger. We'll give you the word when they've got it turned on. Over.

01 11 28 58 CMP

Okay.

01 11 29 44 CC

11, Houston. They don't have it turned on yet. We'll give you the word when they got it turned on. Over.

01 11 29 50 CMP

Okay.

01 11 30 42 CC

Hello, Apollo 11. Houston. We noticed the CRYO pressure dropped a moment ago. Did you stir up the CRYO's? Over.

01 11 30 50 CDR

Roger. We've finished our cycling operations.

01 11 30 53 CC

Roger. Copy. Out.

01 11 33 53 CC

Hello, Apollo 11. Houston. McDonald's got the laser turned on, Would you take a look? Over.

01 11 34 02 CMP

Okay, Charlie.

01 11 34 04 CC

It's bluish-green.

01 11 36 48 CC

11, Houston. We got some shaft and trunnion for you that might tweak it up a little bit. Shaft of 141.5, trunnion of 39.5. Over.

01 11 37 07 CDR

Okay. Stand by.

01 11 38 55 CC

Apollo 11, Houston. If you see it, it should be coming up - appear to be coming up, through the clouds. McDonald reports that there's a break in

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the clouds that they're beaming this thing through. Over.

01 11 39 09 CDR
Roger.

01 11 39 54 CC
Hello, Apollo 11. Houston. You can terminate the exercise on the Laser. Our rates are steady enough now for - to commence the PTC. Over.

01 11 40 06 LMP
Okays Houston. Neither Neil nor Mike can see it. Incidentally, those shafts and trunnions just missed pointing at the world.

01 11 40 17 CC
Roger. Thank you.

01 11 40 26 LMP
As we are looking at it through the scanning telescope, it would be about a - oh, maybe a third of an Earth radii high and to the left.

01 11 40 37 CC
Roger.

01 11 40 39 LMP
But, we did - but we did identify the El Paso area and it appeared to us to be a break in the clouds there, and we looked in that break and saw nothing.

01 11 40 48 CC
Roger. Thank you much. Out.

01 11 43 06 CMP
Houston, Apollo 11. Over.

01 11 43 09 CC
Roger. Go ahead. Over.

01 11 43 13 CMP
Were you following that on the DSKY?

01 11 43 17 CC
Roger. Stand by.

01 11 43 28 CC
11, Houston. What's your exact question? Over.

01 11 43 34 CMP
I've followed the procedure through step 7 down to the point where I've got 27303 ENTER, and this resulted in an OPERATOR ERROR LIGHT.

01 11 43 48 CC
Roger. Stand by.

01 11 45 04 CC
Apollo 11, Houston. Stand by a moment. We'll have an answer for you momentarily. Over.

01 11 45 11 CMP
Okay. Appreciate it, Charlie. Now the light's gone out without any further DSKY action.

01 11 45 16 CC

Roger.

01 11 45 18 CMP

Correction. Stand by; that's not so.

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01 11 45 22 CC

Roger.

01 11 57 06 CC

Apollo 11, Houston.

01 11 57 11 CMP

Houston, Apollo 11.

01 11 57 13 CC

Roger. We've finally gotten concurrence on our problem here with 50 guys looking at it. When we were sitting in the 5018, we attempted to load the erasable before you terminated the VERB 49. So Mike, what we're going to have to do is call up the present CDU's, copy those down, and do a VERB 49, load the present, then do a PROCEED, then an ENTER, and then we can then set up ATTITUDE HOLD in step 6. Over.

01 11 58 03 CMP

Okay. I think that's what we did last time.

01 11 58 10 CC

It appeared to us that we attempted to load the erasable prior to entering on the VERB 49 which VERB 49 was still running, and it clobbered the CDU's. Over.

01 11 58 26 CMP

Okay.

01 12 01 02 CMP

Houston, Apollo 11. We're moving at the proper rate.

01 12 01 06 CC

Hallelujah!

01 12 01 51 CC

11, Houston. It looks great to us now. Over.

01 12 01 59 CMP

It looks fine here, Charlie. The 0.7 part is the only part I don't find explained yet.

01 12 02 05 CC

Roger, Mike. We're working on that one right now. We're coming up with the story soon. Over.

01 12 02 14 CMP

Thank you.

01 12 02 24 CC

11, Houston. We're handing over C0MM to Goldstone. Over. Correction, from Goldstone to Honeysuckle. Over.

01 12 02 32 CMP

Okay.

01 12 02 53 CMP

Hello, Houston through Honeysuckle. Ov - -

01 12 03 00 CC

Apollo 11, Houston. Go ahead. Over.

01 12 03 05 CMP

You sound good to us through Honeysuckle. How do we sound?

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01 12 03 08 CC

Roger. You're five-by, Mike. We'd like the OMNI configuration as follows. OMNI Alfa place in Bravo, OMNI to OMNI, high-gain track to MANUAL, high-gain yaw 270, pitch - -

01 12 04 02 CC

Hello, Apollo 11. Houston. How do you read now? Over.

01 12 04 07 LMP

Roger. I'm reading you loud and clear. I'm not sure I got all those. I've got S-band OMNI B, OMNI, track to MANUAL, and beam wide, pitch - you'd better say that again, and yaw 270. Over.

01 12 04 26 CC

Roger, Buzz. I broke up at pitch minus 50 at beam wide. Over.

01 12 04 37 LMP

Roger. Copy.

01 12 05 24 LMP

Houston, Apollo 11. Are you ready to copy some numbers on status report, et cetera.

01 12 05 30 CC

Say again. Over.

01 12 05 38 LMP

Roger. Are you ready to copy some numbers on the status report, et cetera?

01 12 05 42 CC

Roger. Go ahead. Over.

01 12 05 49 LMP

Okay. Radiation CDR 11005, CMP 10006, LMP 09007; medication negative. And I got some battery and RCS numbers for you.

01 12 06 07 CC

Go ahead. Over.

01 12 06 10 LMP

Battery C 37.1, PYRO battery A and B both 37.1. RCS Alfa 82, Bravo 84, Cocoa 85, Delta 87. Over.

01 12 06 28 CC

Roger, we copy. Radiation 11005, 10006, 09007; no medication; 37.1, 37.1, 37.1, 82, 84, 85, 87. Over.

END OF TAPE

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01 12 06 51 LMP

That's affirmative. And you want a LM/CM DELTA-V? It's 1.1.

01 12 06 56 CC

Roger. Copy 1.1.

01 12 07 56 CC

Hello, Apollo 11. Houston. Please verify that four CRYO heaters AUTO, the four fans off. Over.

01 12 08 07 LMP

Okay. We have been holding the O2 heater number 1 in the OFF position. I believe that was your last instruction. All the other heaters are AUTO and all fans are off. Over.

01 12 08 22 CC

Roger. Stand by.

01 12 08 26 CC

11, Houston. We would like all heaters AUTO. Over.

01 12 08 32 LMP

Roger. All four AUTO, all four fans off.

01 12 09 00 CC

Hello, Apollo 11. Houston. As the Sun sinks slowly in the west, the White Team bids you good night. If we get a story on the seven-tenths, we can give it to you in about 15 minutes or so; if not, we'll give it to you in the morning. Over.

01 12 09 15 CMP

Okay. That sounds fine, Charlie. Thanks.

01 12 09 32 LMP

Hey, you earned your pay today, Charlie. Thank you.

01 12 09 39 CC

Roger. Good night all.

01 12 20 05 CC

Hello, Apollo 11. Houston. One request: the optics switch to zero. And we've got a lot of theories on why it maneuvered at seven-tenths a moment ago, Mike, but no real definite answer. We'll be back with you later. Over.

01 12 20 21 CMP

Okay. No rush, Charlie. Thank you.

01 12 52 06 CC

Hello, Apollo 11. Houston. Over.

01 12 52 10 CMP

Houston, Apollo 11.

01 12 52 12 CC

Roger. Mike, I think we can explain that seventenths rate. When we - the first time through, you know, we failed to go through the VERB 49, so we had a large error between our actual CDU and desired CDU in roll. And with that situation,

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the DAP - the vehicle will roll - will maneuver, rather, at a rate that is loaded in, which was three-tenths plus four-tenths rate, and it will limit at four-tenths above the desired rate, so - that is if we have a large enough angle between the desired and the actual, which we did. So, therefore, the rate was four tenths plus three tenths to give you the seven tenths. Over.

01 12 53 08 CMP

Okay. Thank you.

01 12 53 11 CC

Roger.

END OF TAPE

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REST PERIOD - NO COMMUNICATIONS

Tape 26/1 — Page 130

REST PERIOD - NO COMMUNICATIONS

Tape 27/1 — Page 131

REST PERIOD - NO COMMUNICATIONS

Tape 28/1 — Page 132

REST PERIOD - NO COMMUNICATIONS

Tape 29/1 — Page 133

REST PERIOD - NO COMMUNICATIONS

Tape 30/1 — Page 134

REST PERIOD - NO COMMUNICATIONS

Tape 31/1 — Page 135

02 00 09 00 CC

Apollo 11, Apollo 11, this is Houston. Over.

02 00 09 08 LMP

Good morning, Houston. Apollo 11.

02 00 09 10 CC

Good morning, Apollo 11.

02 00 09 19 LMP

... nice sleep. Be getting around to the ...

02 00 09 34 LMP

How's everything look up here from the ground?

02 00 09 47 CC

Apollo 11, this is Houston. Roger. Say again, please.

02 00 09 54 LMP

Roger. How do all our systems look?

02 00 09 59 CC

Roger. They're looking great, and as far as we can tell everything is good from down here. Over.

02 00 10 08 LMP

Roger. Looks like the attitude held up real well during PTC last night.

02 00 10 13 CC

Yes, it did. We were showing you remaining well within a circle of 10 degrees radius throughout the night. Seems to be working beautifully.

02 00 10 37 CMP

How's the old Green Team this morning? Did you have a quiet night?

02 00 10 40 CC

Yes. It was a very quiet night. Down here the old Black Team is complaining they didn't get a chance to make any transmissions. Ron Evans is getting

02 00 10 53 CMP

Well, we'll be seeing them tomorrow, I guess.

02 00 10 56 CC

Yes. Ron's getting to be known as the silent CAP COMM.

02 00 11 03 CMP

That's the best kind, Bruce.

02 00 11 05 CC

(Laughter) Okay.

02 00 11 41 CC

When you feel up to copying, 11, I've got a couple of small items in the way of a flight plan update and your morning consumables update. Over.

02 00 12 14 LMP

Apollo 11.

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02 00 12 17 CC

Roger, 11. We'd like to perform a waste-water dump at your convenience some time in the near future here. No particular time scheduled. Down air at the time for midcourse correction 3, which is about 53 55, we're deleting midcourse correction number 3 and all the items associated with it. For your information, the calculated value of the burn for midcourse number 3 was eight tenths of a foot per second, that is 0.8 feet per second. Canceling this, if we decide to burn midcourse correction 4, this would then give you a burn for midcourse correction 4 of 2.0 feet per second. At 53 hours we have an IMU realign P52. We're requesting that you do this while in PTC, and we plan to continue PTC throughout the day. Over.

02 00 13 52 CMP

- then we'll get to the waste-water dump - -

02 00 13 57 CC

Say again, please. You're cutting out.

02 00 14 04 LMP

Roger. - -

02 00 14 26 CC

11, this is Houston. Stand by a minute, please. We're having difficulty receiving you.

02 00 15 12 CC

Apollo 11, this is Houston. Radio check. Over.

02 00 15 17 LMP

Roger, Houston. Read you loud and clear. How me? Over.

02 00 15 20 CC

Roger. Reading you the same. We did a minor reconfiguration down here. Stand by. Out.

02 00 16 37 CC

Okay, 11. This is Houston. We switched your OMNI antennas as you rolled through the appropriate position. Did you copy the flight plan update item?

02 00 17 08 CC

Apollo 11, this is Houston. Over

02 00 17 15 LMP

Apollo 11, go ahead.

02 00 17 17 CC

Roger, 11. Did you copy the flight plan update items? Over.

02 00 17 23 LMP

Roger. How do you read me now, Bruce?

02 00 17 29 LMP

Okay. The battery charge is in the process now and the wastewater dump is in work. MCC 3 has been canceled. It would have been 0.8 feet per second. MCC 4 now looks like about 2.4 feet per second. At around 53 hours we'll do a P52 in PTC. Over.

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02 00 17 56 CC

Roger, 11. The magnitudes of the midcourse corrections were just for your information, but midcourse 4 was down around 2.0 feet per second. Again, for your information, on SPS chamber pressure, it looks like your onboard readout of 87 psi corresponds to 92 psi by our telemetry, and your value of 89 on board corresponds to 94. Over.

02 00 18 53 CC

Apollo 11, Houston. Radio check on a new power amplifier in our transmitter. Over.

02 00 19 02 LMP

Roger. Read you loud and clear. How me? Over.

02 00 19 04 CC

Roger. Loud and clear. Did you copy my notes on SPS chamber pressure?

02 00 19 12 LMP

Negative.

02 00 19 13 CC

Okay. Just for your information again, it appears that your readout of 87 psi corresponds to our corrected TM readout of 92 - that's 92 psi, and 89 on board is really 94 psi. Over.

02 00 19 48 LMP

Roger, I got that you were reading about 5 psi low.

02 00 19 53 CC

Roger. And are you ready for the consumables update?

02 00 20 00 LMP

Ready to copy.

02 00 20 02 CC

Okay. Consumables update for GET of 46 plus 00: minus 5.5 percent, minus 6.5 percent, minus 2.5 percent, minus 7.5 percent, minus 5.0 percent, minus 2 pounds hydrogen, plus 1 pound oxygen, and that minus 5.5 percent on the RCS total corresponds to minus 66 pounds. Over.

02 00 20 54 LMP

Okay. I copy those, and I'll give you our percentages now: Alpha 82, Bravo 84, Cocoa 85, Delta 87. Over.

02 00 21 07 CC

This is Houston. We copy your percentages, and do you have a crew status report on sleep For us?

02 00 21 24 LMP

Roger. And in descending order 8, 9, and 8. Over.

02 00 21 30 CC

Houston. Roger. Out.

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02 00 22 54 CMP

Houston, we're getting CRYO pressure warning now in the middle of stirring up the ...

02 00 23 02 CC

Roger. We copy.

02 00 32 35 LMP

Houston, Apollo 11. We've got the continent of Africa ... facing toward us right now, and of course, everything's getting smaller and smaller as time goes on. The Mediterranean is completely clear. The Sun looks like it's about to set around Madagascar. The equatorial belt of Africa stands out quite clearly. We're seeing the dark green or a muddy colored green, compared to the sandier colors in the southern tip of Africa and, of course, the Sahara northern coast of Africa. There's a rather remarkable cloud that appears in the vicinity of the border between Afghanistan and Pakistan. It's just about to go into the sunset now. It is casting quite a large shadow. It's isolated. There don't seem to be any other clouds ... the band of clouds near the tropical convergences clouds down around the equator clearly separate the clockwise and the counterclockwise cloud formations. Over.

02 00 33 57 CC

Roger, 11. We copy your word description on that. I understand you can see a shadow being cast by that cloud over between Afghanistan and Pakistan. Any estimate on how long that shadow would be? Over.

02 00 34 18 LMP

It looks like it's a shadow. Coming around to - back that way - -

02 00 34 33 CC

We're getting a lot of background noise now, also. If you will stand by a minute or so until we roll a little further in PTC, I think things will get better.

02 00 34 44 LMP

Okay. It's coming around to the number 1 window. We'll get you ...

02 00 34 49 CC

Roger, we're hearing you.

02 00 37 02 CC

11, this is Houston. The noise on the COMM seems to have quieted down now. I guess that we've rotated a new antenna into view and probably also the Earth out of view in your window. Over.

02 00 37 17 LMP

Okay. It looks as though the length of the shadow of that cloud is about the same as the width of the Persian Gulf.

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02 00 37 26 CC

Okay. We copy the width of the Persian Gulf, and I guess that all I can give you firsthand is a single isolated data point, and that is that it was clear here in Houston this morning. That's a pretty localized observation. As a result of your waste water dump, it looks like the PTC mode has been disturbed somewhat. We're showing you about 20 degrees out in pitch right now and about 6 degrees in yaw, which is significantly greater, about twice as much - a little more than twice as much as the deviation you had prior to the waste water dump. We're watching it down here, though, and we'll let you know if we think any corrective action is required. Over.

02 00 38 14 LMP

Okay. Maybe we ought to - next time split that in half, and put half of it on one side and half on the other or something like that.

02 00 38 25 CC

Yes. We could do that. We were actually pretty interested in seeing what the effect on PTC would be of the waste water dump. We don't recall ever having performed a waste water dump during PTC on previous missions. Over.

02 00 38 44 LMP

Well, now we know.

02 00 38 46 CC

Roger.

02 00 42 54 LMP

Houston, Apollo 11. I am looking at that cloud now around Pakistan through the sextant, and it appears to be one single cell in the latter stages of development. There is a smaller, more isolated one - -

END OF TAPE

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02 00 45 38 CC

Apollo 11, this is Houston. We lost you down in the noise on the COMM link here about the time you were describing the single cell cloud formation over Afghanistan-Pakistan area through the sextant. Over.

02 00 45 55 LMP

Roger. It came through a lot clearer through the sextant than with the monocular, and you could definitely tell it was one single cell in the latter stages of development. It must have gone up to over 50,000 feet, though. The eastern Mediterranean is phenomenally clear. You can see all the lakes; the Dead Sea stood out quite well. Over.

02 00 46 24 CC

Roger. What appears to be the limit of resolution through that sextant from your current position? Over.

02 00 46 39 LMP

Well, I can't see it right now. It's outside the field of view.

02 00 46 43 CC

Roger.

02 00 46 44 LMP

And, I don't know how you'd really describe the limit of resolution. I will think about that a little.

02 00 46 50 CC

Okay. I guess the smallest object that you could pick out looking through it would give us a pretty good hack.

02 00 47 00 LMP

Well, you can see the Nile River going almost up to its source. The lake is obscured by clouds, but you can trace it all the way on up.

02 00 47 14 CC

Roger.

02 00 47 20 LMP

I guess that is down though, isn't it?

02 00 48 39 CC

Apollo 11, Houston.

02 00 48 46 CMP

Go ahead, Houston.

02 00 48 48 CC

Roger. We have been working under the assumption that it would take about an hour for the interference from a waste water dump to dissipate to the point where you could reasonably take star sightings for platform alignment navigation or something of this sort. If you have a spare minute or two, could you comment on the observation condition, now? Over.

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02 00 49 19 CMP

Yes. Stand by one, Bruce.

02 00 49 21 CC

Okay.

02 00 49 44 CMP

My guess would be the telescope's probably pretty useless, but you can differentiate in the sextant between water droplets and stars by the difference in their motions.

02 00 50 02 CC

Okay, Mike. I guess that we've still got - what you are saying is that we've still got a lot of water droplets visible, but you can pick them out and distinguish them in the sextant, then.

02 00 50 13 CMP

Right. I think so. Buzz is looking through it now. Just a second.

02 00 50 17 CC

Okay.

02 00 56 36 LMP

Houston, Apollo 11. It looks like at this time the sextant would be quite usable for any alignment. There's actually very few ... verticals.

02 00 56 50 CC

Roger, Buzz. How about the telescope? Is it useful now?

02 00 57 02 LMP

Well, it's not quite as useful; it never seems to be. Depending on the position of the Sun, it's got that band that seems to go across the center. I don't think it's because of the waste water particles that it would lack its effectiveness. Over.

02 00 57 22 CC

Roger. What - Is this band something that's deposited on the outside of the optics? Over.

02 00 57 31 LMP

No. I see the reflection from the Sun.

02 00 57 35 CC

Roger.

02 00 57 41 CMP

The Sun bounces off the LM structure. With the LM attached, that telescope is just about useless. Those star charts that MPAD provided us, I think, would be most useful if we had to use the - if for some reason we had to mark through the telescope. We could use those as a guide for what we're looking at and say, "Well, that bright blob over there has got to be that star because that's the position we're in." But so far, we've not been able to pick out any decent star patterns while docked with the LM using the telescope.

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02 00 58 12 CC

This is Houston. We copy.

02 01 40 38 LMP

Houston, Apollo 11.

02 01 41 07 LMP

Houston, Apollo 11. Over.

02 01 41 09 CC

Go ahead, Apollo 11.

02 01 41 18 CC

Apollo 11, this is Houston. Go ahead - -

02 01 41 20 LMP

- - How do your read? Over.

02 01 41 22 CC

Roger. We're reading you loud and clear.

02 01 41 24 LMP

Roger. You're coming back a little scratchy. It looks like our O2 flow transducer's gotten a good bit worse. I just looked at it at the last water accumulator cycling, and it just barely registered - barely crept up above 0.2. Over.

02 01 41 45 CC

Roger.

02 01 42 40 CC

11, this is Houston. At the time of your cyclic accumulator stroking, we were on low-bit-rate data, and consequently not receiving the O2 flow parameter. We expect that what you're seeing is probably nominal. That is, it's probably what we would expect from a transducer that's malfunctioning probably in this fashion, and it's just going to keep on getting worse like that. Nothing to worry about. We'll monitor things on the ground here. Over.

02 01 43 17 LMP

Okay. It does look like it's gradually degrading to about zilch.

02 01 43 24 CC

Roger. We copy.

END OF TAPE

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02 02 40 59 CC

Apollo 11 CDR, this is Houston. Radio check. Over.

02 02 41 07 CDR

Roger, Houston. CDR. Loud and clear.

02 02 41 10 CC

Roger. We're reading you the same. Out.

02 02 41 15 CDR

And would you check with FAO and see where that errata sheet is? We haven't been able to locate that.

02 02 41 24 CC

Roger. I understand it's supposed to be the back page in Buzz's operational checklist.

02 02 41 34 CDR

Okay.

02 03 09 15 CC

Apollo 11, this is Houston. Did you find it? Over.

02 03 09 22 LMP

Roger. We found it.

02 03 09 24 CC

Roger. And I see you're in P00. If you can give us ACCEPT, we'll uplink a new state vector to you and update the CMC clock. Over.

02 03 09 38 LMP

Okay. You've got it.

02 03 09 41 CC

Roger.

02 03 12 44 CC

11, this is Houston. We're through with the uplink. You can go back to BLOCK.

02 03 12 54 LMP

Roger. Back to BLOCK.

02 03 16 30 CC

Apollo 11, this is Houston. We would like to terminate the charge on battery B at GET of 51 30. Over.

02 03 18 06 CC

Apollo 11, this is Houston. We would like to terminate charging battery Bravo at 51 30 GET. Over.

02 03 18 18 LMP

Roger. Terminate charging battery Bravo 51 30.

02 03 18 23 CC

Roger. Out.

02 03 36 35 CC

11, this is Houston. We show you terminating battery B charge. Over.

02 03 37 56 CC

Apollo 11, this is Houston. Over

02 03 38 03 CDR
Go ahead, Houston. Apollo 11.

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02 03 38 05 CC
Roger, 11. We show you terminating battery B charge at about 51 hours 30 minutes. Over.

02 03 38 17 CDR
Okay.

02 03 38 23 CC
Roger. Out.

END OF TAPE

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02 03 59 23 LMP

Houston, Apollo 11. Would you like to have both oxygen and hydrogen purge on? Over.

02 03 59 32 CC

11, this is Houston. Say again. Both what on? Over.

02 03 59 41 LMP

On the fuel cell purge: would you like to see both oxygen and hydrogen? Over.

02 04 00 02 CC

Apollo 11, this is Houston. Affirmative. We request hydrogen and an oxygen fuel cell purge. Over.

02 04 00 17 LMP

Okay. Any preference which first?

02 04 00 22 CC

Negative. As long as you've got the H2 purge line heaters on.

02 04 00 29 LMP

Okay. I'll go get - Go ahead with the hydrogen then.

02 04 58 29 CMP

Houston, Apollo 11. Over.

02 04 58 32 CC

Apollo 11, this is Houston. Go ahead.

02 04 58 38 CMP

Roger. You copy my NOUN 93?

02 04 58 43 CC

That's affirmative. We've got it.

02 04 58 48 CMP

Okay. I am going to go ahead and thrust then. Triangle difference is 0.01, but it's sort of difficult at three-tenths rate. I'm required to use medium speed unresolved, and it's difficult to hold the star centered long enough to get a decent mark on it.

02 04 59 15 CC

Roger. We copy. It looks okay to us.

02 04 59 22 CMP

Roger.

END OF TAPE

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02 05 51 36 CC

Apollo 11, this is Houston. Over.

02 05 51 42 CMP

Go ahead, Houston.

02 05 51 45 CC

Roger. I've got the morning news here if you're interested. Over.

02 05 51 51 CMP

Yes, we sure are. We're ready to copy and comment. Isn't that 2:30 there?

02 05 51 57 CC

Roger.

02 05 52 02 CDR

Okay. Go.

02 05 52 03 CC

Okay. Here we go. The interest in the Flight of Apollo 11 continues at a high level but a competing interest in the Houston area is the easing of watering rules. Mayor Louie Welch promises a lifting of lawn-watering restrictions if the rains continue. Friday is partly cloudy, and there is a 30-percent chance of thunderstorms in the afternoon. In Washington, D.C., the Senate Finance Committee approved extension of the income tax surtax, but a Senate vote on the bill - -

02 05 52 35 CMP

You cut out, Houston. You cut out.

02 05 52 40 CC

Roger. Where do you hold me cutting out? Over.

02 05 52 46 CMP

Houston, Apollo 11.

02 05 52 48 CC

Apollo 11, Houston. Over.

02 05 54 51 CC

Apollo 11, this is Houston. How do you read now? Over.

02 05 54 57 CMP

Loud and clear, Houston. Go ahead.

02 05 54 59 CC

Roger.

02 05 55 00 CMP

Start after the rains in Houston.

02 05 55 03 CC

Roger. In Washington, the Senate Finance Committee has approved extension of the income tax surtax, but a Senate vote on the bill currently seemed remote. In Austin, State Representative Ray Lemmon of Houston has been nominated as the National Director of the American Society for Oceanography. Lemmon has proposed a study of the possibility of establishing an institute of oceanography in Texas. This would be the first such institute on the western Gulf of Mexico.

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In Minneapolis, Minnesota, the weather bureau, after recapping today's weather showing a high of 88 and a low of 72, has noted "snowfall: none." From St. Petersburg, Florida, comes a radio report from the Norwegian explorer, Thor Heyerdahl, which said that the crew of his papyrus boat, the Ra, will sail into Bridgetown, Barbados, despite damage from heavy seas. The crew, however, will sleep on an escort vessel. Norman Baker, navigator of the expedition, said the crew was aboard the Ra today repairing damage from storms this past week, which split the footing of the mast. Part of the broken mast was jettisoned overboard, and the vessel was 725 miles east of the Barbados. "It is possible but uncomfortable to sleep aboard the Ra," Baker said in the radio report. "But the purpose of our voyage is not a test of strength or human endurance." That is the reason why the crew was spending nights aboard the escort vessel Shenandoah, which rendezvoused with the Ra on Tuesday.

02 05 56 39 CC

In sports, the Houston Oilers are showing plenty of enthusiasm in their early preseason workouts at Kerrville, and Coach Wally Lemm says he is impressed with the fine group of rookies. National League baseball yesterday, Thursday: St. Louis 11, Philadelphia 3; Montreal 5, over Pittsburg 4; Atlanta 12, Cincinnati 2; San Francisco 14, and Los Angeles 13. American League: we have Baltimore 3, over Cleveland 2; Detroit 4 to Washington's 3; Minnesota 8 to Chicago 5. Boston at New York was rained out. And in Corby, England, an Irishman, John Coyle has won the world's porridge eating championship by consuming 23 bowls of instant oatmeal in a 10-minute time limit from a field of 35 other competitors. Over.

02 05 57 48 CMP

Roger. I assume Houston didn't play yesterday.

02 05 57 51 CC

That's correct.

02 05 57 55 CMP

I'd like to enter Aldrin in the oatmeal eating contest next time.

02 05 58 00 CC

Is he pretty good at that?

02 05 58 04 CMP

He's doing his share up here.

02 05 58 13 CC

Let's see. You all just finished a meal not long ago, too, didn't you?

02 05 58 20 LMP

I'm still eating.

02 05 58 24 CC

Okay. Does that - that - -

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02 05 58 27 CMP

He's on his - He's on his 19th bowl.

02 05 58 30 CC

Roger. Are you having any difficulties with gas in the food bags like the 10 crew reported?

02 05 58 40 CMP

Well, that's intermittently affirmative, Bruce. We have these two hydrogen filters, which work fine as long as you don't hook them up to a food bag. But the entry way into the food bag has enough back pressure to cause the - the filters to start losing their efficiency. A couple of times, I've been tempted to go through that dryout procedure, but we found that simply by leaving the filters alone for a couple of hours, their efficiency seems to be restored.

02 05 59 14 CC

Roger. We copy.

02 05 59 23 CMP

Their efficiency ranges anywhere from darn near perfect to terrible just depending on the individual characteristics of the food bags we're putting through them. Some of the food bags are so crimped near the entry-way that there's no way we can work them loose to prevent back pressure.

02 05 59 44 CC

Roger.

02 06 32 12 CC

Apollo 11, this is Houston. Over.

02 06 34 22 CC

Apollo 11, this is Houston. Over.

02 06 34 32 CDR

Hello, Houston. Go ahead.

02 06 34 33 CC

Roger, 11. As you've probably noticed, your coning angle in PTC mode is increased substantially as a result of the waste water dump, the fuel cell purge, and a natural coupling, so it looks like we are going to have to terminate PTC here in a little while. And we'd like to get your feeling as to whether you're still anticipating trying to send back TV signals from inside the LM; and if so, we'll try to provide an attitude that you can hold that'll give us high gain antenna lock on the Earth during the TV and LM activation period. Over.

02 06 35 18 CDR

Yes, we're still planning that activity if the cord lengths work out all right, and we'll accept those attitudes that you work up for us.

02 06 35 29 CC

This is Houston. Roger. Out.

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02 06 35 34 LMP

When you work up an attitude to get high gain, is there any way that we could get partial Sun in one of the two LM front windows?

02 06 35 46 CC

This is Houston. We'll have a look at it.

02 06 39 14 CC

Apollo 11, this is Houston. Over.

02 06 39 20 CDR

Go ahead, Houston.

02 06 39 21 CC

Roger. We have a TV attitude for you if you're ready to copy.

02 06 39 32 CMP

Go ahead. Ready to copy.

02 06 39 35 CC

Okay. We recommend stopping PTC at GET of 54 45 00, and this should put you at just about the right roll angle. The attitude we recommend is roll 263, pitch 090, yaw 000. This gives you the Earth out of window number 1 in the command module and places the high gain antenna in the CSM window for TV at your convenience. You will also have the Sun shining in - or shining

at the hatch on the LM, and if you take down the window shades you should get some sunlight in. We're recommending wide deadband. Over.

02 06 40 36 CMP

Roger. Thank you, Houston. We'll look at that.

02 06 40 41 CC

Roger. Out.

02 06 42 53 CMP

Houston, Apollo 11. When we pass the proper roll angle, we're not going to be anywhere near zero degrees yaw. Do you want us to just stop and try until we find ourselves in and then VERB 49 the three angles you gave us?

02 06 43 06 CC

Stand by.

02 06 43 20 CC

Hello, Apollo 11. Houston. We'd like you to stop at the proper roll angle, then do a VERB 49 to the roll and pitch. Over. Correction, roll and yaw.

02 06 43 52 CMP

Houston, Apollo 11. Over.

02 06 43 54 CC

Go ahead, 11. Over.

02 06 44 12 CC

Hello, Apollo 11. Houston. Do you read? Over.

02 06 44 20 CMP

Houston, Apollo 11. Over.

02 06 44 22 CC

Roger, 11. Do you read me? Over.

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02 06 44 38 CC

Hello, Apollo 11. Houston. Over.

02 06 44 46 CMP

Stand by, Charlie. Yes, we'r going to come out of PTC here at 263 roll and then do VERB 49 to thc recommended attitude.

02 06 44 58 CC

That sounds fine to us. Over.

02 06 46 56 CC

Hello, Apollo 11. Houston. Before you open the pressure equalization valve, we'd like the LM/CM DELTA-P. Over.

02 06 47 06 CMP

Okay. Let me check it again. It was about 155.

02 06 47 12 CC

Roger.

02 06 47 14 CMP

I read it 158 right now, Charlie.

02 06 47 17 CC

Roger. Thank you much.

02 06 49 51 CMP

Houston, Apollo 11. We're stopping PTC at 263 ... 0.

02 06 49 59 CC

11, Houston. You're about one-by on this transmission. Say again. Over.

02 06 50 08 CMP

Houston, Apollo 11. Do you read?

02 06 51 46 CMP

Houston, Apollo 11. How do you read on the high gain?

02 06 51 50 CC

11, how do you read me? Over.

02 06 51 55 CMP

Read you loud and clear, Charlie. We just switched to HIGH GAIN, and we stopped PTC at roll 263, pitch 90, yaw 0. How do you read?

02 06 52 03 CC

Roger, Mike. You're five-by now on the high gain. We're right between the OMNI antennas and pretty horrible COMM on the OMNI's. We got you five-by on the high gain, and we copy the PTC stoppage. Over.

02 06 52 18 CMP

Okay, fine.

02 06 52 35 CMP

Houston, we're going to open the DIRECT O2 valve and start pumping up the cabin.

02 06 52 40 CC

Roger. Copy.

02 06 53 06 CC

Apollo 11, Houston. We're going to hand over to Goldstone for uplink in about 2 minutes. We might have a momentary dropout of COMM. Over.

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02 06 53 16 CMP

Alright. Can you hear our master alarm in the background? That's O2 FLOW HIGH coming through this amplifier.

02 06 53 27 CC

Roger. Copy.

02 06 53 37 CMP

That photoelectric cell is a good device. It's worked very well.

02 06 53 46 CC

11, Houston. Say again. Over.

02 06 53 50 CMP

I say that photoelectric cell amplifier for the master alarm is a good device. It's working very well, and it's a nice pleasing tone.

02 06 54 00 CC

Roger. Copy. Thank you.

02 06 54 08 CMP

Makes you almost glad to get master alarms.

02 06 55 01 CMP

Houston, Apollo 11. As a matter of curiosity, our O2 flow meter is pegged FULL-SCALE HIGH.

02 06 55 08 CC

Roger, 11. We copy that here. Over.

02 06 55 14 CMP

Okay.

02 06 55 26 CMP

Boy, that transducer's working somewhat.

02 06 55 32 CC

Roger.

02 06 55 51 CC

11, Houston. We'd like to try to attempt to correlate your O2 flow in transducer with the flow valve that you've got open. How far - How far open would you say you have the REPRESS O2? Over. Correction, the DIRECT O2.

02 06 56 10 CMP

Stand by, Charlie.

02 06 56 19 CMP

Okay, Charlie. It's not open very far. It's hard to give you a good reading without shunting it again, but the arrow is at about the one o'clock position. Now I reduce the flow, and I'll let it stabilize here. Right now our onboard reading is about 0.4, and that's with the arrow in the O2 valve at the two o'clock position. Would you rather have comparisons of O2 flow readings or would you rather have valve position comparisons?

02 06 56 48 CC

Roger. Stand by.

02 06 56 52 CC

EECOMM's say they'd like to look at valve positions. Over.

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02 06 57 01 CMP

Okay. Well, we're holding steady now at 0.3 pound per hour, and our cabin pressure is about 54; and I'll close the valve momentarily and then open it again to this position and tell you how much travel is required.

02 06 57 18 CC

Roger.

02 06 57 29 CMP

It's about 30 degrees of travel, Charlie, from the closed position, which is with the arrow pointing at about three to three-thirty, four o'clock.

02 06 57 38 CC

Roger.

02 06 57 47 CMP

Our flow is stabilized now at 0.6.

02 06 57 55 CC

Roger. We copy. We're reading the same.

02 06 58 00 CMP

Okay.

02 06 58 06 CMP

Yes, open it back to the one o'clock position.

02 06 58 10 CC

Roger.

02 06 58 31 CMP

Is that enough different positions, or you want more, Charlie?

02 06 58 36 CC

Mike, that's good - good enough. We're satisfied now. Over.

02 06 58 42 CMP

Okay.

END OF TAPE

Tape 36/1 — Page 153

02 07 02 02 CMP

Houston, Apollo 11. We've terminated direct O2, our cabin pressure is 57, and, as a matter of curiosity, when we turn the DIRECT O2 valve OFF, we get a master alarm just like they did in the spacecraft testing.

02 07 02 17 CC

Roger.

02 07 02 20 CC

11, Houston, we have a little update for you. When you go into the LM, we'd like you to unstow and bring back to the command module the following items. Over.

02 07 02 35 CMP

Ready to copy.

02 07 02 36 CC

Roger. We'd like you to pick up the - out of the flight data file, the surface checklist, the mission rules NO-GO card, the DPS, APS, RCS limit cue card. Over.

02 07 04 34 CC

Apollo 11, Houston. The reason we wanted you to bring those three items back, we'll have some updates for you, for those three. Over.

02 07 04 45 CMP

Roger. We figured you would.

02 07 09 58 CC

Apollo 11, Houston. We're getting the TV at Goldstone. We're not quite configured here at Houston for the transmission. We'll be up in a couple of minutes. Over.

02 07 10 13 CMP

Roger. This is just for free. This isn't what we had in mind.

02 07 10 17 CC

Roger.

02 07 19 49 CC

Apollo 11, Houston. It's a pretty good show here. It looks like you almost got the probe out.

02 07 19 54 CMP

Yes, it's loose now.

02 07 19 55 CDR

Can you see that?

02 07 19 58 CC

Roger, Neil. It's really good.

02 07 20 03 CDR

Not much light up in that area, but apparently the TV set's able to pick it up.

02 07 20 10 CC

There are some bright spots shining on the probe. Apparently Sun shafting on it that just gets just about enough for us to make it out. Over.

Tape 36/2 — Page 154

02 07 20 21 CDR

I think those are the tunnel lights.

02 07 20 22 SC

...

02 07 20 24 CC

Oh, Okay. You're right.

02 07 20 32 CDR

Okay. It's loose now. Coming down.

02 07 20 35 CC

Roger.

02 07 20 57 CC

Looks like it's a little bit easier than doing that in the chamber.

02 07 21 04 CDR

You bet. This is the only way ...

02 07 21 05 CMP

You have to take it easy.

02 07 21 06 CDR

It's pretty massive, but it goes where you direct it.

02 07 21 11 CC

11, Houston. That's a beautiful picture now, we've got. We're looking at a 12-second delay. To us you are just bringing it down by the optics now.

02 07 21 27 CDR

Mike must have done a smooth job in that docking. There isn't a dent or a mark on the probe.

02 07 21 33 CC

Roger.

02 07 21 38 CC

We're really getting a great picture here, 11. Over.

02 07 22 00 CC

11, Houston. With a 12-foot cable, we estimate you should have about 5 to 6 feet excess when you get the camera into the LM. Over.

02 07 22 11 CDR

Roger.

02 07 22 14 CC

We can see the probe now. Correction, the drogue.

02 07 22 22 CDR

Roger.

02 07 23 04 CDR

Okay. Drogue removal's coming next.

02 07 23 06 CC

Roger. As we suspected.

02 07 24 07 CC
11, Houston. Now it's a good view of the storage area under the couch.

02 07 24 35 CC
11, Houston. Looks like you're pretty crowded in there with that drogue. Over.

Tape 36/3 — Page 155

02 07 24 43 CDR
Oh, it's not really bad.

02 07 24 44 CMP
This TV cable is getting in the way.

02 07 24 54 CC
We see lots of arms.

02 07 25 20 LMP
The only problem, Charlie, is these TV stagehands don't know where they stand.

02 07 25 27 CC
Well, you got to really have a union card, there. We can't really complain too much, I guess.

02 07 26 28 CC
Apollo 11, Houston. Do you have a little white dot in the bottom of your monitor - TV monitor? Over.

02 07 26 39 LMP
Roger. We do.

02 07 26 41 CC
Roger. I guess part of the camera's been burnt out down there. These are really beautiful pictures now, Buzz. Over. Real clear.

02 07 26 56 LMP
Okay. We might have got just a little bit of Sun in there. Is it just one small white dot?

02 07 27 01 CC
That's affirmative.

02 07 27 42 CMP
We went up in the tunnel checking the roll angle, Charlie, and it's 2.05 degrees.

02 07 27 48 CC
Roger. Copy. 2.05 on the roll CAL.

02 07 27 55 CMP
And that's a plus.

02 07 27 57 CC
Roger. Plus.

02 07 28 45 CC
11, Houston. The tunnel looks pretty clear to us. Somebody going up there now. Over.

02 07 28 53 CDR
It's Mike checking his connectors up there now.

02 07 29 00 CC
Roger.

02 07 29 08 CC

11, Houston. The lighting up in there looks very good to us at this time. Over.

02 07 29 22 CDR

I think that's mostly the camera. It - it's subdued to say the least.

02 07 29 30 CC

Roger. It's pretty - It's gathering pretty well to us. We see everything quite clearly up in there.

02 07 30 05 CMP

Well, the docking latches look good today just like they did yesterday. Everything up in there looks just fine.

Tape 36/4 — Page 156

02 07 30 12 CC

That sounds fine to us. Over.

02 07 30 45 CC

11, Houston. We can even read the decals up there on the LM hatch.

02 07 30 53 LMP

Well, let me zoom it up and see how much you can read.

02 07 30 57 CC

Okay.

02 07 31 11 CC

We can see the LM umbilical connection quite well there, Buzz. We see you zooming in on one of the decals now. It's, "To reset, unlatch handle; latch behind grip and pull back two full strokes." That's about all we can make out.

02 07 31 35 LMP

Hey, you get an A-plus.

02 07 31 37 CC

Thank you very much, sir. At least I passed my eye test.

02 07 31 46 LMP

I'm standing 6 feet from it, Charlie, and you can read it better than I can. There's something wrong with the system.

02 07 31 54 CC

Roger.

02 07 33 08 CC

That's a real good view of the LM hatch handle there, 11. Over.

02 07 33 16 CDR

Roger.

02 07 33 24 CDR

Looks like we'll be ready to go into the LM early if that's okay with you all down there.

02 07 33 34 CC

Roger. It's fine with us, Neil. Go ahead anytime you wish. Over.

02 07 33 57 CC

11, Houston. The white spot you see on your monitor, our TV people say it is a burn spot; but they expect it to dissipate after a couple of hours. Over.

02 07 34 14 LMP

Roger. Thank you.

02 07 35 23 CMP

Okay, the dump valve is actuated.

02 07 35 26 CC

Roger. Copy, 11. We see that very clearly. Is that you, Buzz, with your hand on it?

02 07 35 33 CMP

Yes.

02 07 35 34 LMP

Roger.

Tape 36/5 — Page 157

02 07 36 10 CC

11, Houston. We're really amazed at the quality of the picture up in the tunnel. It's really superb. Over.

02 07 36 18 LMP

It is, considering the amount of light up in there.

02 07 36 20 CMP

Roger. We're about to open our hatch now.

02 07 36 23 CC

Roger.

02 07 36 32 CMP

Roger. There's that same guy that, when you open up the door, why, he's waiting there for you, and he turns the lights on.

02 07 36 38 CC

How about that. Just like the refrigerator.

02 07 37 08 CC

Buzz, the view in through your - by your right - left shoulder there is so good we can see the ascent engine cover, the Velcro on it, and that's about all we can make out right now.

02 07 37 27 CC

Now we can see the helmet stowage bag - -

02 07 37 28 LMP

We don't see anything loose up there.

02 07 37 30 CC

Well, great. Looks good to us. We see the helmet storage bag.

02 07 37 53 CC

Hello, 11. Houston. We got a view of the PLSS there, off the right of our screen.

02 07 38 35 CC

11, Houston. Buzz, you already in? Over.

02 07 38 42 LMP

Roger. I'm halfway in, hanging out. Start turning around, I guess.

02 07 38 46 CC

Roger.

02 07 39 14 CC

Apollo 11, Houston. We'd like you to read out the LCG reservoir sight level. Over.

02 07 39 27 CMP

Okay. Stand by.

02 07 39 50 CC

11, we have a good view of the window there. It looks like the Sun's finally coming through the shade.

02 07 40 00 LMP

Yes, I'm afraid it's - We're just about plus Z toward the Sun.

02 07 40 05 CC

That's affirmative. This attitude put both windows right toward the Sun - or the LM. Over.

Tape 36/6 — Page 158

02 07 40 15 LMP

Well, that may be good in some respects, but -

02 07 40 22 CC

We had a view, Buzz, of the utility light cord. ...

02 07 40 31 LMP

Now let me show you a view looking the other way.

02 07 40 33 CC

Roger. And we see right now the utility light or either the floodlight up there.

02 07 40 45 CC

I think now I see the utility light still in the stowage bag. Hey, that's a great shot right there. We see you in there. Guess that's Neil and Mike. Better be, anyway.

02 07 41 13 CC

We see you waving.

02 07 41 33 CC

11, Houston. That's really a beautiful shot.

02 07 41 46 CC

11, Houston. We didn't quite decipher that signal that just came from the CMP.

02 07 41 55 LMP

Just saying hello. On the LCG sight gage, you got about - oh, it looks like the white mark that's in the plunger is about a quarter to three-eighths inch out into the green away from the red. Is that what you'd like to see? Over.

02 07 42 18 CC

Stand by. Roger, Buzz. That looks good to us. Thank you much.

02 07 42 28 LMP

It is the white index, is it not, that you're interested in comparing whether it's in the red or green?

02 07 42 34 CC

Stand by. That's affirmative, Buzz. It looks good. That's a good reading for us. Over.

02 07 42 42 LMP

Okay.

02 07 42 46 CC

We had a shot moment - a moment ago of the suit disconnect valve.

02 07 42 58 LMP

I'll open up the windows and see what the lighting condition's going to be like.

02 07 43 24 CC

11, Houston. That's a real good view we have of the AOT. You're back now, Buzz, and notice you're taking down one of the window shades. Over.

Tape 36/7 — Page 159

02 07 43 36 CC

The light is superb.

02 07 43 37 LMP

How's the Sun coming in? How's the Sun coming in from this direction going to affect what you can see?

02 07 43 44 CC

It made it really super. The lighting is excellent in the - in the LM right now. We can make out the AOT, the ISA, and the left-hand window - there's a little glare off of that, but the LMP side the - with the shade down it's really excellent. Over.

02 07 44 08 LMP

Well, let's - I'm turned around, why I took the shade off my side first.

02 07 44 16 CC

Roger. We copy. The light level for the TV is really excellent. Over.

02 07 44 29 CDR

Yes, the lighting in the LM is very nice now, just like completely daylight; and everything is visible. A good bit lighter than the tunnel was earlier.

02 07 44 43 CC

Roger. We got a good view now, Neil, of the DEDA; and also Buzz's ACA.

02 07 45 05 LMP

Hey, I'm pointing it at the front hatch now. Everything seems to be in place down there.

02 07 45 11 CC

Roger, we got the dump valves in view. Over.

02 07 45 13 LMP

Roger.

02 07 45 44 CC

11, Houston. We see you removing the ISA now, folding it up, putting it up on the AOT. The instrument panels are coming into view behind.

02 07 45 58 LMP

Yes, I think it'd probably be best, since we've done SPS burn, to put it back over the instrument panel instead of putting it up over the PLSS on the recharge station. Would you care to comment on that one? We could do either just as easily.

02 07 46 12 CC

Stand by. We'll have an answer for you momentarily.

02 07 46 18 CC

11, Houston. That's really a super shot of the main display.

Tape 36/8 — Page 160

02 07 46 59 LMP

The vehicle is surprisingly free of any debris floating around. It's very clean.

02 07 47 04 CC

Roger.

02 07 47 17 CC

11, Houston. It's pretty hard to describe this view. It's really - really great.

02 07 47 23 LMP

Now you know how we feel.

02 07 47 30 LMP

Okay. Neil's OPS is about 57, 5800.

02 07 47 35 CC

Copy.

02 07 47 36 LMP

And mine's about 5800, also.

02 07 47 39 CC

Copy.

02 07 48 04 CC

11, Houston. That's a good shot of Neil's PLSS, there. Over.

02 07 48 16 LMP

No, that's mine.

02 07 48 40 CC

11, Houston. That moment - a moment ago, we had a good shot of your PLSS, Buzz, and the two helmet stowage bags. Down behind your left shoulder, Buzz, we have the - the DSKY and the ACA.

02 07 50 01 LMP

We're going to go ahead and take all the Moon data on back into the command module, Charlie.

02 07 50 07 CC

Roger.

02 07 50 58 CC

Apollo 11, Houston. Buzz, it appears that you're intending to put on the Sun filter and view the Sun through the AOT. Over.

02 07 51 09 LMP

Yes, unfortunately it looks like it's down a little bit more towards ... than I can be able to see in the AOT.

02 07 51 17 CC

Roger.

02 07 52 15 LMP

We got a beautiful view of the side of the command module out of the AOT looking in the left rear detent.

02 07 52 23 CC

Roger.

02 07 52 24 LMP

I can see the hatch and all the - all the EVA handrails. First time we've seen the silvery outside of the command module.

Tape 36/9 — Page 161

02 07 52 40 LMP

I can read the letters on the hatch cover. It's a boost cover release; and the big yellow arrow that points toward the opening - place where the tool B goes.

02 07 52 55 CC

Roger. Great shot now back down into the -

02 07 53 01 CMP

And left on the - -

02 07 53 04 CC

Go ahead, Buzz. Over.

02 07 53 07 LMP

Say again.

02 07 53 08 CC

I was just saying we got a great shot looking back into the command module.

02 07 53 09 LMP

...

02 07 53 14 LMP

Okay. And the left detent, I can see the AO - or the rendezvous radar, and I move to the forward detent and that's about all I've got. I'm looking eyeball to eyeball.

02 07 53 25 CC

Roger.

02 07 54 08 LMP

Charlie, is there any concern about the duration that we ought to have the window shades open?

02 07 54 14 CC

Stand by.

02 07 54 17 LMP

We don't have - We don't have any circulation in here, and it might get a little on the warm side.

02 07 54 23 CC

Roger.

02 07 54 30 CMP

We'll - We'll put up a couple of hoses in the command module here and get a little circulation going.

02 07 54 36 CC

Sounds like a good idea. Over.

02 07 55 04 CC

Apollo 11, Houston. As far as the window shades go in this LM, there's nothing except for crew comfort. I don't think we've got any systems problem. Be sure to put them back up when you egress. Over.

02 07 55 17 LMP

That we will do.

02 07 55 52 LMP

Charlie, I'll give you a view out of the overhead window, back looking at the command module right-hand rendezvous window.

Tape 36/10 — Page 162

02 07 56 01 CC

Roger.

02 07 56 19 CC

Well, we see it now. Thanks a lot, Buzz. That's a good view through the overhead.

02 07 56 32 LMP

One washer on -

02 07 56 38 LMP

One washer's on by the overhead.

02 07 56 42 CC

Roger.

02 07 56 49 CC

There we go. We got it now.

02 07 56 58 LMP

There wasn't very much debris in the command module or the LM. We found very few loose particles of bolts, nuts, and screws and lint and things. Very few in each spacecraft. They were very clean.

02 07 57 14 CC

Roger. Sounds good.

02 07 57 45 CC

11, Houston. We have a good view out of the rendezvous - correction, the overhead window of the LM. We don't see anybody staring back at us, though. Over.

02 07 59 03 LMP

Charlie, can you see Mike's two eyeballs staring out through the rendezvous window?

02 07 59 11 CC

11, Houston. Stand by. We haven't picked him up yet.

02 07 59 22 LMP

You are looking through a lot of layers of glass.

02 07 59 38 CC

11, Houston. We had a - -

02 07 59 40 LMP

... on my monitor.

02 07 59 41 CC

We had a slight glimpse of Mike in the rendezvous window at that time. It's pretty murky looking into there, though.

02 07 59 48 LMP

Okay. Here he is; I've got him. I've got him on the monitor now.

02 07 59 55 CC

Okay. We see him staring back at us now. Hello, in there.

02 08 00 28 CC

Apollo 11, Houston. Our recommendation for the ISA is to stow it back over the instrument panel. Over.

02 08 00 42 LMP

Roger. Will do.

Tape 36/11 — Page 163

02 08 01 56 CC

11, Houston. We can make out the markings on the panel. We read SYSTEM A ASCENT FUEL, ASCENT OXIDIZER. Quad 1, quad 4. The - It's really unbelievable, the definition we're getting down here off that little camera. Over.

02 08 02 14 CC

We can even see the barber pole on the talkbacks.

02 08 02 24 CC

We can read the markings on the instruments for the glycol pressure, quantity, PCO2. You can even read the scale on the eight ball. Over.

02 08 02 58 CC

11, Houston. We see the cross-feed barber pole, and we have the Velcro patches back up to the RCS systems now. We can see the markings on the meters, green and red bands, in limits.

02 08 03 27 CC

We see you raised the cover on the abort stage. We don't recommend that.

02 08 03 34 LMP

Yes. We're going to tape that one over.

02 08 03 35 CC

Roger.

02 08 03 36 LMP

We're going to tape that one over.

02 08 03 37 CC

We concur.

02 08 03 44 LMP

The restraints in here do a pretty good job of pulling my pants down.

02 08 03 53 CC

Roger. We haven't quite got that before the 50,000,000 TV audience, yet.

02 08 04 17 CC

11, Houston. That's a good view of the eight ball. We see - You can even read the OFF flag, there.

02 08 04 30 CC

You can see the signal strength meter for the radar, read the numbers on it.

02 08 04 54 LMP

Houston, did you want us to test the cameras in the LM and - I was wondering about that. I saw it in the flight plan, but I'm just wondering if you want to do that on CSM power, or do you want us to take both of the 16mm cameras back in the CSM and test them there? Over.

02 08 05 18 CC

Stand by, Buzz.

02 08 05 21 LMP

As an alternative to that, why, we could wait LOI day and do it then when we transfer over to LM power.

Tape 36/12 — Page 164

02 08 05 32 CC

Roger. Stand by. We'll have an answer.

02 08 05 47 CC

11, Houston. On that TV, our commentary - The monitor I was looking at was delayed about 12 seconds, 12 to 15 seconds while it went through our color converter. It was probably - You thought I was crazy, but we were looking at it 15 seconds after you broadcast it. 11, Houston - -

02 08 06 06 LMP

We understood that, Charlie.

02 08 06 08 CC

Okay. On the LM cameras, we'd like you to do it on LOI day with the LM power. Over.

02 08 06 19 LMP

Okay. That's what we'll do.

02 08 07 16 LMP

Houston, we're showing you something that came out of the Commander's checklist stowage packet. It's got a 16-millimeter camera in it, and it's got this little cylinder; and I guess - I don't understand what it is. Maybe you can tell us.

02 08 07 35 CC

Roger. Stand by. We can't figure it out either.

02 08 07 46 LMP

It's got an arrow on the back, and it says "turn," but I'm afraid to turn it.

02 08 07 56 CC

11, your friendly geologist says it's the camera crank- crank, excuse me, for the 16-sequence camera if it jams. Over.

02 08 08 10 LMP

All very well. Thank you.

02 08 08 28 LMP

There's that word again. The ancillary stowage container.

02 08 08 35 CC

Roger.

02 08 09 10 CC

The shades couldn't quite hack it, there, Buzz. Over.

02 08 09 51 CMP

Houston, 11. Are you still getting high bit rate off the OMNI's at this distance?

02 08 09 56 CC

Stand by, Mike.

02 08 10 07 CC

Apollo 11, Houston. About 50 percent of the time, we're getting high bit rate off the OMNI's when you're in PTC. Over.

02 08 10 17 CMP

Okay. Thank you.

02 08 10 19 CC

You're welcome.

Tape 36/13 — Page 165

02 08 11 24 CC

Apollo 11, Houston. Neil, at this attitude you look like you're about 12 feet long.

02 08 11 34 CDR

It seems like I always find myself upside-down in whatever I'm doing around here.

02 08 12 29 CC

Apollo 11, Houston. Could you give us a few comments on your crew comfort with the CSM hoses moving the air around? Over.

02 08 12 42 LMP

Well, it's picking up a little bit on circulation in here.

02 08 12 47 CC

What do you estimate the temperature is, Buzz? Over.

02 08 12 57 LMP

Oh, I'd say maybe 73, 75.

02 08 13 02 CC

Roger.

02 08 13 06 LMP

It's hard to tell at this density and pressure of gas, but comfort level is about the - about the same as the command module.

02 08 13 20 CC

You probably - -

02 08 13 21 LMP

It was a little warmer or stuffier when we first got in, but it seems to be improving.

02 08 13 27 CC

Houston copies. Out.

02 08 14 28 CC

11, Houston.

02 08 14 29 LMP

You may be able to see some - -

02 08 14 31 CC

Go ahead.

02 08 14 32 LMP

- - some particles jumping around on your screen. That's just dust particles that are being illuminated by Sun shafting in the window.

02 08 14 42 CC

Roger. They're very clear now. Over. And that's a good view of Neil's - correction, of Buzz's circuit breaker panel, there.

02 08 15 50 LMP

I can just barely see the handrail on the front porch from the position on the right-hand window.

02 08 15 59 CC

Roger.

02 08 16 15 CC

11, Houston. Our view of the Panel 11 is - gets brighter, then darker. Are you changing the f-stop at all? Over.

Tape 36/14 — Page 166

02 08 16 32 LMP

No, what's happening is, we get pretty close to the window now and then, and it drives the automatic light control into the stop, I think.

02 08 16 42 CC

I think that's right.

02 08 16 51 LMP

Yes, I had the switch on OUTSIDE while I was going through the overhead window. That may be what's contributing to some of it.

02 08 16 58 CC

Roger.

02 08 17 05 CC

11, Houston. We seem to be picking up a few more dust particles now. We see them quite clearly in the screen now. Over.

02 08 17 17 LMP

Yes, I'm choking on one every so often.

02 08 17 41 CC

11, Houston. Your show is going out to the U.S. now. We're about to get the satellite up. It'll be transmitted to some other countries after that. Over.

02 08 17 58 LMP

Roger. I'm checking out this window bracket where I'll be putting it for the EVA pictures of Neil going down the ladder.

02 08 18 08 CC

Roger.

02 08 18 17 CC

Apollo 11, Houston. We keep marveling about the color and the clarity of the picture. It's really difficult to describe. It's - It's just perfect. Over.

02 08 18 31 CC

And, 11, it doesn't look like you're having too much trouble with that bracket up there, Buzz.

02 08 18 41 LMP

I'll tell you, those new knobs really make it easy to twist the thing and get it cinched down quite tight.

02 08 18 50 CC

Roger.

02 08 20 06 CC

11, Houston. Buzz, how does the alignment look, there?

02 08 20 13 LMP

It looks pretty good, as well as I can tell without the gear extended. I can't get a real definitive answer, but you couldn't fix it any place to see much more out of the window without hand-holding it for the whole time.

02 08 20 29 CC

Roger. Looks like to us it's going to work real well.

Tape 36/15 — Page 167

02 08 20 31 LMP

Give it enough room to - Yes, I think so.

02 08 21 02 CC

Buzz, we see you putting your window guard in place there, and back up to the ISA now.

02 08 21 59 LMP

Houston, ask FAO if the 90-degree bracket isn't stowed in the Commander's stowage assembly.

02 08 22 09 CC

Stand by.

02 08 23 35 CC

11, Houston. Buzz, you still looking for that 90-degree bracket? Over.

02 08 23 45 CDR

Yes, he is looking for it now.

02 08 23 47 CC

Roger. We'll have a word for you in just a moment.

02 08 24 28 CDR

Our monitor shows pretty good, clear pictures from this angle. I already found the 90-degree bracket.

02 08 24 37 CC

Roger, Neil. It's really a super picture. We've got the ACA, your ACA, the picture of the throttle, the 90-degree bracket. We see your handles, and now over to the bracket.

02 08 25 25 LMP

That's about the position we'll be putting the camera in after the initial descent on the ladder, and it'll be taken 1 frame a second for most of the EVA.

02 08 25 40 CC

Houston copies. Out. That's a real good view of that camera.

02 08 26 03 LMP

Our monitor is a little bit wavy, so it's hard for us to tell when we're - when we've got a steady picture for you.

02 08 26 11 CC

11, we have no complaints at all. We don't see that waviness on our picture. It's just really great. Over.

02 08 26 19 LMP

Do the edges of the window look like straight lines to you?

02 08 26 22 CC

That's affirmative.

02 08 26 26 LMP

Okay. They don't in our monitor, and that leads us to make some corrections to the camera, which probably aren't required sometimes.

Tape 36/16 — Page 168

02 08 26 39 CC

Buzz, we have no complaints at all. It's a magnificent picture.

02 08 27 49 CC

What was that, Buzz, you're chasing now?

02 08 27 55 CDR

That was - That was me picking up some particles of paint that were floating through the air in front of the camera, there.

02 08 28 02 CC

Roger, Neil. We got it. It appears to us that Neil's about to check the Velcro mat, there.

02 08 28 17 CC

Okay, Buzz. We see the card up now.

02 08 28 26 LMP

Okay. For those of you that don't know, this is where we log most of our data for each of the LM maneuvers, and we have another card like this that the timeline book that is laid down on the table in front of the data display keyboard; and it's on this timeline that we have all our procedures. But we obviously have to hold these in place in zero g, so we make use of the Velcro patches on the back and on the table so we can attach these down here; and then we just turn the pages over when we go to new sequences in our timeline of procedures.

02 08 29 13 CC

Roger.

02 08 29 18 LMP

And we're ready to copy DOI PAD.

02 08 29 21 CC

Roger. We'll have the FIDO's work that one up for you momentarily.

02 08 30 26 CC

11, Houston. That was a good shot of Panel 2. Now we got Panel 3 in view with the TEMP MONITOR switch. The stabilization - station and control panel, we see now, with the MODE CONTROL switches. Now over to the rendezvous radar. Real good.

02 08 30 48 CC

11, that's real good camera work.

02 08 31 06 LMP

That'll be the most unusual position a cameraman's ever had, hanging by his toes from a tunnel and taking the picture upside-down.

02 08 31 17 CC

Roger. Well you're doing a super job. We got a good view of the cross pointer, there. Had a good view of the tape meter.

Tape 36/17 — Page 169

02 08 31 41 LMP

We're giving you a picture now of the floor of the cabin. I think you can see the - one of the two portable life support system backpacks here in the center, and on each side, we have the two helmet visors. I'll remove one of them and show you a little closer view of what this looks like.

02 08 32 04 CC

Roger.

02 08 32 10 LMP

Inside the helmet visors are the EVA gloves with the blue tips. I'm about to take those out now.

02 08 32 27 CC

Roger, Buzz. That's a great shot now that we're getting of the helmet, the EVA visor, and also the - the EVA gloves in the background.

02 08 32 41 LMP

Okay. You did say this was going out now, didn't you?

02 08 32 45 CC

Standby. I think so.

02 08 32 58 CC

11, you got a pretty big audience. It's live in the U.S. It's going live to Japan, western Europe, and much of South America. Everybody reports very good color. Appreciate the great show.

02 08 33 15 LMP

Roger. Understand. Thank you.

02 08 33 48 CC

Buzz, that was a good demonstration of your EVA visor assembly. Appreciate it.

END OF TAPE

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02 08 34 39 CC

Hey, I like the good view of Mr. Collins down there. We finally see him again.

02 08 34 46 CMP

Hello there, earthling.

02 08 34 54 CC

Hello there.

02 08 35 24 CC

11, Houston. We noticed when you were scanning over Panel 2 a moment ago, 1 and 2, the two eight balls were slightly in disagreement. Control said he'd like a AGS align, there.

02 08 35 39 LMP

Yes. One of them's AGS, one of them's PNGCS. The problem is, we don't know whether to align AGS to PNGCS or PNGCS to AGS.

02 08 35 51 CC

Stand by.

02 08 35 58 CC

11, Chris said he can tell you.

02 08 36 05 LMP

We'll cage them both.

02 08 36 08 CC

Roger.

02 08 37 01 LMP

Like old home week, Charlie, to get back in the LM again.

02 08 37 04 CC

Roger. I can imagine.

02 08 37 24 CDR

The traverse from the bottom of the LM to the aft bulkhead of the command module must be about 16, 20 feet. It's not a disorienting one at all, but it's most interesting to contemplate just pushing off from one and bounding on into the other vehicle all the way through the tunnel.

02 08 37 44 CC

Roger. Must be some experience. Is Collins going to go in and look around?

02 08 37 56 CDR

We're willing to let him go but he hasn't come up with the price of the ticket yet.

02 08 38 01 CC

Roger. I'd advise him to keep his hands off the switches.

02 08 38 08 CDR

If I can get him to keep his hands off my DSKY, it'd be a fair swap.

02 08 38 13 CC

Roger.

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02 08 38 18 CMP

That's why I've been eating so much today. I haven't had anything to do. He won't let me touch it any more.

02 08 38 23 CC

Roger.

02 08 38 55 CC

11, Houston. If that's not the Earth, we're in trouble.

02 08 39 00 CDR

That's the Earth, and we have a very good view of it today. There are a few more cloud bands on than yesterday when we beamed down to you, but it's a beautiful sight.

02 08 39 34 CDR

We have some horizontal banding in our TV monitor. Are we transmitting that to you, or do you have a clear picture?

02 08 39 41 CC

Neil, we have a very clear picture. The only thing that we see is a little white dot in the bottom of our screen, which is - our TV guys say is an - apparently a burned out spot in the camera, but it should come back. Over.

02 08 39 59 CDR

Roger. We have that in our monitor also.

02 08 40 20 CC

11, Houston. We do have three lines across our TV. I thought it was just a transmission problem, but everybody's telling me now that it's probably - it's on the downlink. Over.

02 08 40 35 CDR

No, those are the same three ones that we have.

02 08 40 37 CC

Okay.

02 08 40 47 LMP

How far are - out are we now, Charlie?

02 08 40 51 CC

Stand by. Give you exact figure.

02 08 41 00 CDR

Did you notice the difference between yesterday and today? This is as large an image we can - we can give you.

02 08 41 05 CC

Roger. If you think we're smaller, you're now 177,000 miles out. Over.

02 08 41 13 LMP

Thank you.

02 08 41 14 CDR

That's nautical miles?

02 08 41 17 CC

That's affirmative, 11. We -

02 08 41 23 LMP

... Hold on.

02 08 41 24 CC

Go ahead. Over.

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02 08 41 34 CC

11, Houston. We see the - still see the banding along the intratropical convergence. I guess the most predominate one now is around the - up in the - around the equator or slightly north of the equator.

02 08 41 51 LMP

Yes, that's the way it looks, Charlie. Same as yesterday.

02 08 41 54 CC

Roger.

02 08 42 05 LMP

Just keep the Pacific Ocean nice and clear and calm on splash day, is all we ask.

02 08 42 31 CDR

And Charlie, I'd like to say hello to all my fellow scouts and scouters at Farragut State Park in Idaho having a National Jamboree there this week; and Apollo 11 would like to send them best wishes.

02 08 42 47 CC

Thank you, Apollo 11. I'm sure that, if they didn't hear that, they'll get the word through the news, surely appreciate that.

02 08 43 32 CC

11, Houston. We have you - your subspacecraft point is just off the western coast of South America directly south of about Mexico City. Over.

02 08 43 46 CDR

That - That looks like what we observe from here.

02 08 44 02 CDR

And we're going to turn our TV monitor off now for a short bit while we have some other work to do. Apollo 11 signing off.

02 08 44 12 CC

Roger, 11. Thank you very much. That was one of the greatest shows we've ever seen. We sure appreciate it. Over.

02 08 44 20 CDR

It was a pleasure.

02 08 45 50 CC

Hello, Apollo 11. Houston. Could you give us an idea of about how long it will be before you start close - closing the LM back up? Over.

02 08 46 00 CDR

We've got a little more work to do up here, Charlie. We're going to make sure that we have everything transferred around and stowed the way we want it and try to get a little bit ahead on tomorrow's timeline. I suppose that we could be out of there in another half hour or so if it was necessary.

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02 08 46 23 CC

Roger, Neil. We're not trying to push you. We're just trying to get an idea of - about water dumps and starting up the PTC again. Take your sweet time. Over.

02 08 46 34 CDR

Okay. We'd like to get a flight plan update from you for the next couple of hours, here. When you think what the various constraints might be and what - what order you might like us to do things.

02 08 46 53 CC

Roger. Stand by. We'll have that to you in a moment.

02 08 56 08 CC

Hello, Apollo 11. Houston. Mike, we'd like to go ahead and do a waste-water dump. We'd like you to dump it all the way down to zero. Over.

02 08 56 21 CMP

Roger. We copy that, Charlie.

02 08 56 31 CMP

How does that work, Charlie?

02 08 57 26 CDR

Houston, 11.

02 08 58 04 CC

11, Houston. Did you call? Over.

02 08 58 09 CDR

Roger. Just noticed that the mast that the EVA light is on is charred brown. It looks as though it took quite a beating during launch.

02 08 58 23 CC

Roger.

02 08 58 24 CDR

The EVA light still does work.

02 08 58 27 CC

Roger. We'll let this - the SPAN guys look at this, and we'll be back with you with what we think. Over.

02 08 58 37 CDR

Okay.

02 09 00 21 CC

11, Houston. We were wondering, Neil, with your closing comment on the TV, if you were going to turn it off. It indicated that you might be considering turning it back on. We were wondering whether we want to keep the lines up. Over.

02 09 00 35 CDR

Well, we want your recommendation on that, but I think we would just as soon, ourselves, terminate the TV. But if you have a commitment to keep, we'd be more than willing to turn it back on.

02 09 00 52 CC

Roger. Stand by.

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02 09 01 25 CC

Apollo 11, Houston. We'd like to terminate the TV. We don't - We think we got a really - a good tape. That hour and a half show was superb. And we'd like to pick up TV - correction - PTC at about 58 hours. Over.

02 09 01 44 CDR

Roger. PTC at 58 hours.

02 09 01 48 CC

And we'll have the remaining functions in the flight plan soon. Over.

02 09 01 56 CDR

Okay. Fine.

02 09 04 05 CC

Apollo 11, Houston. Our recommendations on the activities for the next hour or so, as far as flight plan goes, are: Continue your LM familiarization as desired until about 58 hours, then ingress to the CSM, close the hatch, and establish PTC shortly thereafter. Over.

02 09 04 27 CC

And, Apollo 11, Houston. Terminate the - -

02 09 04 29 LMP

Okay.

02 09 04 30 CC

- - the water dump. Over.

02 09 04 31 LMP

Okay, Charlie. Thank you.

02 09 04 34 LMP

Okay. Water dump being terminated now.

02 09 17 48 CMP

Houston, Apollo 11.

02 09 17 51 CC

11, Houston. Go ahead.

02 09 17 55 CMP

Roger, Houston. I'd like to do a P52 option 3 and tweak the platform up prior to starting the PTC. Over.

02 09 18 03 CC

Roger, 11. Stand by.

02 09 18 14 CC

11, Houston. That sounds like a good idea to us. Go ahead.

02 09 18 20 CMP

Okay. And the platform's looking pretty good to me. It looks like the worst axis drift is 0.01 something degrees per hour. Is that about what you figure?

02 09 18 27 CC

11, Roger. We've had reports all the marks have been good all the - the last couple of times you've run them. Just a moment; I'll get you some

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information on the apparent drift rate.

02 09 18 41 CMP

Okay, Owen. Thank you. You got the maroons on?

02 09 18 47 CC

Say again, 11.

02 09 18 51 CMP

I say you got the maroons on now?

02 09 18 54 CC

Not permanently, Mike. Just have a stand-by here while Charlie's out checking how to use that special tool on the camera. The maroon team will be on tomorrow.

02 09 19 06 CMP

Okay. Nice to hear your voice. How's everything going?

02 09 19 09 CC

Everything's going smoothly here. We sure enjoyed the show this afternoon, Mike.

02 09 19 15 CMP

Okay.

02 09 19 27 CC

11, Houston. We suggest you go ahead and do the P52 first, and we'll take a look at the angles and give you some new drift rates after taking a look at them. Over.

02 09 19 37 CMP

All right. Fair enough.

02 09 25 00 CC

Apollo 11, Houston. Over.

02 09 25 05 CDR

Go ahead. 11, here.

02 09 25 07 CC

11, Houston. A little information to you there, CDR. We've all taken a momentary brief respite from our work here to have some special - to have a bite of special moon cheese that is - I understand it's been sent to us directly from Wapakoneta, your own hometown. Over.

02 09 25 29 CDR

No, we can't - we can't pronounce it either. I think you'll enjoy that. They make a fine brand of cheese.

02 09 25 37 CC

Roger, there, and I'll polish up the grammar for the next trip.

02 09 25 50 CMP

Houston, 11. You are looking at the NOUN 93, and I'll proceed when you copy them.

02 09 26 00 CC

11, Houston. We've got them.

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02 09 26 08 CMP

Okay.

02 09 28 15 CC

Hello, Apollo 11, Houston. We'd like P00 and ACCEPT. We have a DELTA-H update for you. Over.

02 09 28 23 CMP

All right, Charlie. Stand by one.

02 09 29 31 CMP

Houston, Apollo 11. P00 and ACCEPT.

02 09 29 33 CC

Roger.

02 09 31 48 CC

Apollo 11, Houston. We got the load in. The computer's yours. Over.

02 09 31 56 CMP

Houston, 11. Roger.

02 09 36 04 CC

Hello, Apollo 11. Houston. We'd like for you to stir up the CRYO's now. Over.

02 09 36 14 CMP

Houston, Apollo 11. Roger.

02 09 44 33 CDR

Houston, Apollo 11. We're completed in the LM. We're closing up the hatches and the probe and drogue back in.

02 09 44 42 CC

Roger. We copy. Out.

02 09 59 38 CC

Hello, Apollo 11. Houston. We're standing by to watch your startup on the PTC at any time. You can start off at the VERB 49. Over.

02 09 59 48 CDR

Wilco. We're just finishing up the probe and about to close up the hatch here. We're going to be a couple of minutes late, probably, getting started in the PTC.

02 09 59 59 CC

Roger. No sweat, 11. We're standing by. Over.

02 10 06 08 CC

Hello, Apollo 11. Houston. Mike, there's no wait required. Where rates are steady, you can proceed on. Over.

02 10 06 17 CMP

I'm doing it, Charlie.

02 10 06 18 CC

Roger.

02 10 06 24 CMP

The tunnel's all taken care of, the drogue, probe, and hatch all back.

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02 10 06 28 CC

Roger. Copy. Out.

END OF TAPE

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02 10 10 01 CC

Hello, Apollo 11. Houston. We have some new additions to your alternate contingency checklist if you would break that out. Over.

02 10 10 15 CDR

Stand by.

02 10 11 46 CDR

Okay, Houston. 11's ready to copy.

02 10 11 48 CC

Roger, 11. If you'll turn to page F2-22. Over

02 10 12 27 CDR

Okay. I have F2-22.

02 10 12 31 CC

Roger, Neil. Under column 1 - that's column Lima, line 06. The new data is 00001. Line 07, the new data is 02134. Over.

02 10 13 01 CDR

Okay. I have in F2-22, column Lima, item 6, 00001; item 7, 02134.

02 10 13 20 CC

Roger. That's correct. Thank you much. Out.

02 10 13 37 CC

11, Houston. For your information, those two entries are an update to your DELTA-H that we have already uplinked into the CMC. Over.

02 10 13 47 CDR

Roger. Thank you.

02 10 14 04 CMP

What was I marking on, Charlie? About an 18-kilometer line, or what?

02 10 14 09 CC

We - Our update puts you to - the DELTA-H to 35 kilometers, Mike. Over.

02 10 14 17 CMP

Okay.

02 10 19 24 CC

Hello, Apollo 11. Houston. We've got some switch positions for you for the high gain. Over.

02 10 19 33 LMP

Okay. Go ahead.

02 10 19 35 CC

Roger, Buzz. Select Bravo, 0MNI, HIGH-GAIN TRACK to MANUAL; BEAM, WIDE. Over.

02 10 19 48 LMP

Okay. Bravo, 0MNI; TRACK, MANUAL; and BEAM, WIDE.

02 10 19 53 CC

Roger. And your high-gain angles are minus 50 on the pitch, 270 on the yaw. Over.

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02 10 20 03 LMP

Okay. Going there now.

02 10 41 22 CC

Hello, Apollo 11. Houston. We have some updates and some things we'd like to talk to you about, if you aren't in the middle of your meal. If it's convenient anytime for you, we're ready with some updates. Over.

02 10 41 46 CDR

What - What are the updates going to apply to?

02 10 41 51 CC

Roger. We have a couple of changes on the LM mission rules NO GO for your NO GO card, Neil. One slight change on the APS/DPS fuel and TEMP pressure card, and we have a change to the procedure for the secondary radiator leak check, which is to be formed at - performed at 71 hours tomorrow, and also some indications that we have a couple of landing site obliques stored in the wrong place. Over.

02 10 42 36 CDR

Okay. Is any of those in the flight plan? The secondary radiator, for example?

02 10 42 43 CC

That's affirmative. The secondary radiator leak check is called out in the flight plan at 71 20. That procedure is listed in your launch operations book on page 2 9, L2 9. We'd like to change that procedure. Over.

02 10 43 08 CDR

Okay. Stand by.

02 10 43 25 CMP

Charlie, on the secondary leak check, just read it verbatim like you want, and I'll copy directly into the flight plan and not fool around with the checklist.

02 10 43 32 CC

Roger. That's fine. If you're ready to copy, stand by.

02 10 43 37 CMP

Ready to copy on the leak check.

02 10 43 40 CC

Roger. It's monitor secondary accumulator quantity. Step 2 is secondary glycol to radiator valve, NORMAL for 30 seconds, then BYPASS. If no decrease in secondary accumulator quantity - Are you with me?

02 10 44 21 CMP

Yes, I'm with you.

02 10 44 22 CC

Okay. If no decrease in secondary accumulator quantity, secondary glycol to radiator valve to NORMAL. Next step, secondary coolant loop pump,

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AC 1 or AC 2. After 3 minutes, verify glycol discharge secondary pressure 39 to 51 psig. Also verify secondary EVAP out TEMP has changed. Next step, secondary coolant loop pump, OFF. Secondary glycol to radiator valve, BYPASS. That ends the procedure. Over.

02 10 45 52 CMP

Okay. I read back: monitor secondary accumulator quantity; secondary glycol radiator valve, NORMAL for 30 seconds, then to BYPASS. If no decrease in secondary accumulator quantity, secondary glycol to radiator valve to NORMAL. Secondary coolant

loop pump, AC 1 or 2. After 3 minutes, verify glycol secondary discharge pressure 39 to 51 psig. Verify secondary evaporator outlet TEMP has changed. Secondary coolant loop pump, OFF. Secondary glycol radiator valve to BYPASS. And what's the reason for the change, Charlie?

02 10 46 27 CC

Roger. Stan is concerned that our present procedure as shown in the checklist does not really flow glycol through the radiator, and it - They want to verify that we do not have a plugged secondary radiator. Over.

02 10 46 48 CMP

Okay. They have any abnormal indications in that system, so far?

02 10 46 52 CC

Negative. This is the procedure that they came up with. It's just a check, Mike. Everything's looking great to us. Over.

02 10 47 02 CMP

Okay. Fine.

02 10 47 31 CDR

Charlie, we'll get back with you on these other changes in a few minutes. Okay?

02 10 47 38 CC

Roger, Neil. No hurry. Over.

02 11 10 57 CC

11, Houston. We're wondering who's on horn.

02 11 11 09 CMP

Say again, Houston?

02 11 11 12 CC

We just had a little music there.

02 11 11 21 CMP

We'll keep you entertained.

02 11 11 28 CC

Roger. That was good. You can keep it coming down, 11.

02 11 11 36 CMP

Okay.

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02 11 12 34 CMP

Because it's a special occasion today, Houston. This is the third anniversary of Gemini 10.

02 11 12 42 CC

Roger. Happy anniversary.

02 11 12 51 CMP

Thank you, sir.

02 11 19 32 LMP

Houston, Apollo 11. Ready to copy your update.

02 11 19 35 CC

Roger. Stand by.

02 11 19 50 CC

Okay, Buzz. The first item is that we have indications that your landing site obliques are not in the proper position. If you'll check, we think that the intermediate scale landing site oblique is stowed in the CSM lunar landmark book. We think that the large scale landing site oblique is stowed in the back of the LM lunar surface map book. Over.

02 11 20 38 LMP

I think I heard you Charlie, but I'm not sure that I understand.

02 11 20 45 CC

Roger. According to our stowage list the - the landing site oblique should be in the transfer bag. In - But in the backup set of data, the intermediate scale oblique is in the CSM lunar landmark book, and the large scale oblique is in the back of the LM lunar surface map book; and that's the reason we think that they might be not where you think they are. Over.

02 11 21 15 LMP

Okay. We've got three obliques. The last one is one I asked for recently. It's just a blow up of the second one. The first one is one that's got dotted lines on it, indicating horizon view and 50-degree LPD; and all three of those are in the transfer book. Over.

02 11 21 34 CC

Roger. Fine. We were wrong in our - in our backup set. We had those out of place. Looks like the onboard data's good. We just wanted to let you check on that one. We have an update on the APS/DPS fuel card that you place on the panel. It's a typo error. If you'll break out that little card, we've got the - correct that typo error. Over.

02 11 22 10 LMP

Stand by.

02 11 23 05 LMP

Okay. I got it.

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02 11 23 07 CC

Roger, Buzz. Under the DPS column on the pressure side, you go down to the fourth item, says pressure greater than 150 PTCA should be greater than 65 percent. Over.

02 11 23 28 LMP

Okay. That's greater than 1.8 but less than 65 and greater than 150 for greater than 65.

02 11 23 35 CC

That's affirmative. Out.

02 11 23 46 CC

And we have three items on the mission rules NO-GO card, if you're ready to copy those. Over.

02 11 24 32 LMP

Okay. I've got the mission rules NO-GO.

02 11 24 34 CC

Roger, Buzz. First entry's on the EPS under AC bus A. The line extends all the way to high gate. Actually, the line should read - at DOI it would be NO-GO AC bus A. After that the NO-GO would be both buses. So if you will just pencil in both buses from PDI through high gate, it'll be correct for that line. Over.

02 11 25 20 LMP

Okay. I've got that: AC bus A for DOI and both buses NO-GO for PDI on.

02 11 25 28 CC

That's affirmative up until high gate. You can stop at the line in front of the column "5 minutes to low gate". Now the next line is under the G&C PGNS, pitch and roll GDA's. You can scratch that line completely. Over.

02 11 25 56 LMP

Roger. Got it.

02 11 25 57 CC

Okay, Buzz. Last entry is down under RCS, and it's a typo error under the three - in the line "three axis attitude control". If you proceed to the right at PDI plus 05, you'll see one axis. The line goes all the way to low gate to touchdown. That's incorrect. The line should stop under "5 minutes to low gate". Over.

02 11 26 38 LMP

Okay. We're stopping that at "5 minutes to low gate".

02 11 26 41 CC

That's affirmative. That completes that card. The rest of the updates are just really for your information based on our 58 hour platform - look at the platform. We are really good shape. Your GYRO's have almost no drift in them since - plotted update we were looking at X of a minus 2.24 ...

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Y of point plus 0.87, Z of minus 0.11. Since the update, which was based on the 52 hour P52, I believe, we gave you an X drift of plus 0.79, yaw of plus 1.06, Z of plus 0.02 ... I can see the difference between the 52 hour and the 57 hour alignments were - did not really give us enough time to get a real good or completely valid update on the drift check. So we're real satisfied with the way the GYRO's are looking. The PIPA's are looking great also. We are in real good shape with those, too. Over.

02 11 32 21 CDR

This is Apollo 11. Radio check.

02 11 32 23 CC

Roger. Reading you five by. How me? Over.

02 11 32 28 CDR

Okay. Loud and clear. You cut out when you were talking about the platform - something about 52 hours and after that, we never heard you again.

02 11 32 37 CC

Roger. Guess we were changing antennas. Stand by. That's affirmative, 11. We were swapping antennas on you down here. Basically the word is that we have a real good platform, very small drift on the GYRO's, and very small drift in the PIPA's. Over.

02 11 33 00 CDR

Roger. Thank you. And I would like to have a few words of clarification if you will give them to me on the RCS ... what that change of pitch may mean.

02 11 33 14 CC

Copy. A few words of clarification on the RCS? Oh. Roger. The update there, Neil, you are speaking of about the one axis down to 5 minutes of low gate?

02 11 33 31 CDR

Yes. That's right. I'm not quite sure what that ... means beyond 5 minutes.

02 11 33 38 CC

Stand by. I'll make sure I got my story straight with Control. Stand by.

02 11 33 44 CDR

Okay.

02 11 34 33 CC

11, Houston. On the RCS, what we are saying is that if we lose control about one axis prior to low gate, we would recommend an abort. This would require a - a loss of - of two distinct jets which is not very probable, but that is what we are recommending. After low gate we would continue on. We would recommend that we continue on to attempt a landing. Over.

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02 11 35 13 CDR

Roger. I think I ...

02 11 35 17 CC

Roger.

02 11 35 45 CMP

Charlie, did you say you had some updates for me from the lunar surface book?

02 11 35 49 CC

Apollo 11, say again. You were cut out. Over.

02 11 35 55 CMP

Roger. Did you say you had some updates for us in the lunar surface book. Over.

02 11 36 00 CC

Negative. At this time, we do not have any updates for the lunar surface book. We wanted you to have it just in case. Over.

02 11 36 12 CMP

Roger. You were cut out that time.

02 11 36 15 CC

Roger. At the present time, we do not have any updates for you on the lunar surface book. We are thinking about some and kicking them around, but they're very minor changes. Over.

02 11 36 37 CC

11, Houston. Did you copy that transmission?

02 11 37 09 CC

Apollo 11, Houston. We swapped antennas on you again. I say again that we do not have any lunar surface update - book updates at this time. We're considering a few minor ones, but we're still kicking them around the MOCR. Over.

02 11 37 27 CMP

Apollo 11, I understand.

END OF TAPE

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02 11 45 31 CDR

Houston, 11. We have a crew status report for you.

02 11 45 34 CC

Roger. Go ahead, 11.

02 11 45 39 CDR

Okay. Radiation: CDR 11009, CMP 10010, LMP 09011. No medication.

02 11 45 55 CC

Roger, 11. We copy for the radiations. And, we're considering - this PTC looks sort of weird to us, so we're considering stopping and starting over again, and we'll be with you in a couple of minutes. Over.

02 11 46 15 CDR

Okay.

02 11 47 46 CC

Apollo 11, Houston. Would you give us the LM/CM DELTA-P reading? Over.

02 11 48 45 CC

Hello, Apollo 11. Houston. We switched the antennas on you again. Would you please give us the LM/CM DELTA-P reading? Over.

02 11 49 43 CC

Hello, Apollo 11. Houston. Over.

02 11 49 48 CDR

Go ahead. 11 here.

02 11 49 50 CC

Roger. We switched antennas on you, there, moments ago, Neil. Could you please give us the LM/CM DELTA-P reading? Over.

02 11 50 00 CDR

It's less than 0.1.

02 11 50 02 CC

Roger.

02 11 50 13 CMP

0.15, now, Neil says, Charlie.

02 11 50 16 CC

Roger. Thank you, Mike. Could you give us some help? This PTC is strange: it's not like anything we've seen before. We were wondering if you have had any events or any odd data that could help us out. Over.

02 11 50 35 CMP

I didn't understand that. Say again.

02 11 50 38 CC

Roger. We're looking at a - sort of a funny looking PTC. We've already drifted out to 70 degrees in pitch and we're wondering if you all have had any vents or any such thing as that, that could have caused us to pick up these rates to drive us off. Over.

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02 11 51 09 CMP

Negative, Charlie. We don't know of anything.

02 11 51 11 CC

Roger.

02 11 51 13 CMP

Unless it's got something to do with that entry from the position that we want to be in. I don't know.

02 11 51 21 CC

Roger. When we started off, it looked real fine to us. Now it's drifting off with a funny pattern that we haven't seen previously on a flight. And we're just trying to figure out - I think we'll probably start it over again. We'll be with you momentarily. Over.

02 11 51 39 CMP

Okay.

02 11 55 12 CC

Apollo 11, Houston. We hate to say it, but we'd like to terminate this PTC and start over again. We have no assurance that we're going to get it through the sleep period with this funny configuration, or funny pattern. We'd like you to stop it now and go back to pitch 090, yaw 0, and roll - whatever you stop on. Over.

02 11 55 42 CMP

Roger.

02 11 58 37 CC

11, Houston. We recommend you disable Bravo and Charlie; select quads Alfa and Delta. Over.

02 11 59 25 CC

Apollo 11, Houston. Over.

02 12 02 30 CC

Apollo 11, Houston. Over.

02 12 03 07 CC

Apollo 11, Houston. Over.

02 12 03 40 CC

Apollo 11, Houston. Over.

02 12 05 55 CC

Apollo 11, Houston. Do you read? Over.

02 12 11 09 CC

Hello, Apollo 11. Hello, Apollo 11. Over.

02 12 11 32 CDR

... Apollo 11. Go ahead.

02 12 11 35 CC

Roger. Reading you about one-by. Looks like we picked a super attitude here for PTC stabilization. We're reading you in BAC-KUP VOICE now. Over.

02 12 11 51 CDR

Roger. We read you loud and clear.

02 12 11 53 CC

Roger.

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02 12 12 03 CDR

Would you like us to pick another antenna?

02 12 12 06 CC

I think we've got about the best configuration. We've been doing it all from the ground here, 11. We'll just keep it as it is. Over.

02 12 12 16 CDR

Roger.

02 12 14 32 CC

Apollo 11, Houston. Would you select COMMAND RESET and OMNI Alfa? Over.

02 12 15 03 CDR

Houston, 11 on OMNI Alfa.

02 12 15 06 CC

Roger. We read you about three-by now. Over.

02 12 15 12 CDR

Roger.

02 12 17 19 CC

Apollo 11, Houston. We is stable; you can start the PTC. Over.

02 12 17 29 SC

...

02 12 20 59 CMP

Houston, Apollo 11. Checklist page F9 7; I've completed step 8, and I'd like to know what you think is ideal timing between step 8, step 9, and step 10 on that page? Over.

02 12 21 15 CC

Roger. Stand by.

02 12 22 46 CC

Apollo 11, Houston. We don't see any time constraint. We'd like you to go ahead and set up the wide deadband and then go through step 10 and 11. Over.

02 12 22 57 CMP

Okay. Will do. I don't see any constraint here, Charlie. I was just checking to make sure, because last time, I went from 8 to 9 to 10 to 11 a little bit more swiftly than I'd been doing in the past.

02 12 23 09 CC

Roger.

02 12 23 58 CMP

Step 11 complete.

02 12 24 02 CC

Roger. We copy.

02 12 24 22 CC

Apollo 11, Houston. Would you please select OMNI Bravo? Over.

02 12 24 30 CMP

Roger. Bravo.

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02 12 24 43 CMP

Houston, Apollo 11. How do you read on Bravo?

02 12 24 46 CC

Roger. Reading you five-by.

02 12 24 50 CMP

Same here.

02 12 25 07 CC

Apollo 11, Houston. Looks like we've got a good PTC going. It's good night from the White Team. Over.

02 12 25 17 CMP

Okay. See you tomorrow. Thank you for everything.

02 12 45 38 CDR

Houston, Apollo 11.

02 12 45 41 CC

Go ahead, 11. Over.

02 12 45 46 CDR

Do you have any idea where the S IVB is with respect to us?

02 12 45 50 CC

Stand by.

02 12 49 02 CC

Apollo 11, Houston. The S IVB is about 6000 nautical miles from you now. Over.

02 12 49 14 CDR

Okay. Thank you.

02 12 50 07 CMP

Houston, Apollo 11. How's the PTC looking?

02 12 50 11 CC

Stand by.

02 12 50 32 CC

11, Houston. The PTC looks great to us. Over.

02 12 50 38 CMP

Hey, do you have any idea what happened to the previous one?

02 12 50 42 CC

We have absolutely no idea. Over.

02 12 50 49 CMP

Okay. Did, it look like it was all right, then just all of a sudden start diverging?

02 12 50 57 CC

That's negative, Mike. If you'll look at the plot, which we'll save for you and let you see it postflight, it started off immediately on the first REV and just spiraled out to about - oh 20 to - 20 degrees in pitch, and then it seemed to be setting up a spiral around an offset pitch point of about 20 degrees off from 90 degrees; but we didn't want to take a chance that it would become stable at that point. We thought it might diverge, and so we called you and started over again. Over.

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02 12 51 39 CMP

Okay, no complaints. I was just curious as to what had happened.

END OF TAPE

Tape 40/1 — Page 190

REST PERIOD - NO COMMUNICATIONS

Tape 41/1 — Page 191

REST PERIOD - NO COMMUNICATIONS

Tape 42/1 — Page 192

REST PERIOD - NO COMMUNICATIONS

Tape 43/1 — Page 193

REST PERIOD - NO COMMUNICATIONS

Tape 44/1 — Page 194

REST PERIOD - NO COMMUNICATIONS

Tape 45/1 — Page 195

02 21 10 24 LMP
Houston, Apollo 11.

02 21 11 01 LMP
Houston, Apollo 11.

02 21 13 14 CT
Goddard voice, Houston COMM TECH. Goss conference.

02 21 13 17 MSFN
You're loud and clear. How me?

02 21 13 19 CT
Roger. Read you the same.

02 21 13 21 MSFN
Roger.

02 21 17 37 CT

Madrid, Houston COMM TECH. Net 1, voice check.

02 21 17 41 CT

Houston COMM TECH, Madrid. I read you loud and clear.

02 21 17 44 CT

Roger. Read you loud and clear also.

02 21 18 07 LMP

Hello, Houston. Apollo 11.

02 21 18 16 CC

Apollo 11, Houston. Good morning.

02 21 18 21 LMP

Good morning. Are you planning a midcourse correction 4 this morning?

02 21 18 26 CC

That's negative. Midcourse number 4 is not required. We were going to let you sleep in until about 71 hours if you'd like to turn over.

02 21 18 38 LMP

Okay. That'll be fine.

02 21 18 48 CC

Say again, Buzz. You were cut off there.

02 21 18 52 LMP

OkaY. I'll see you at 71 hours.

02 21 18 55 CC

Roger.

END OF TAPE

Tape 46/1 — Page 196

02 23 03 30 CC

Apollo 11, Apollo 11, this is Houston. Over.

02 23 03 38 LMP

Good morning again, Houston. Apollo 11.

02 23 03 41 CC

Roger 11. Good morning. When you - -

02 23 03 48 LMP

Would you like the O2 purge this morning?

02 23 03 52 CC

Yes indeed. O2 fuel cell purge at 71 hours, and when you feel like copying, I've got a flight plan update containing - I guess that and some other items for you.

02 23 04 08 CDR

Okay. Stand by.

02 23 06 59 LMP

Houston, Apollo 11. Go ahead with the flight plan update.

02 23 07 05 CC

Roger, 11. This is Houston. At approximately 71 hours to 72 hours, we have you down for an eat period which I imagine is probably in progress already. 71 hours: O2 fuel cell purge; 72 hours GET: CO2 filter change number 6, secondary radiator flow check. And we'll send you up a P37 block data on a 2 hour pass, pericynthion pass, return mode abort. At 73 hours 00 minutes: stop PTC at approximately 0 degrees roll. That is, when you're ccming up on 0 degrees roll angle around 73 hours, we'd like you to stop PTC. And perform a P52 option 3 remaining in the PTC REFSMMAT for a drift check. 73 hours, 20 minutes: we'll give you a P27 update to the landing site REFSMMAT, LOI 1 state vector, and target load. 73 hours 30 minutes: maneuver to 000 roll, pitch, and yaw; high gain antenna angles will be pitch 0, yaw 335; and perform a P52 option 1 using the new landing site REFSMMAT. Resume the nominal flight plan at 74 hours GET. Over.

02 23 09 08 LMP

Okay. We'll get started on the fuel cell purge while we're eating. CO2 canister change number 6; secondary radiator flow check; copy some pads. Also at 72 hours, stop PTC 0 roll at 73; do a P52 option 3; we'll get your uplink REFSMMAT for the landing site; and at 000 - let's see, now was this with the old REFSMMAT or the new REFSMMAT?

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02 23 09 45 CC

This is with the - -

02 23 09 46 LMP

- - ... antenna and, pitch - -

02 23 09 50 CC

- - This is with the new REFSMMAT, Buzz.

02 23 09 58 LMP

You said you want the P52 done at that attitude with the new REFSMMAT?

02 23 10 05 CC

Roger.

02 23 12 01 CC

Apollo 11, this is Houston. Over.

02 23 12 17 CC

Apollo 11, this is Houston. Over.

02 23 12 35 CC

Apollo 11, this is Houston. Over.

02 23 12 41 CMP

Houston, go ahead.

02 23 12 42 CC

Roger, 11. Correction on my last. At 73 20, we uplink you the new REFSMMAT. And at 73 30, we'd like you to maneuver to 0 roll, 0 pitch, 0 yaw in the old REFSMMAT. And then torque around to the new REFSMMAT and run your P52 option 1 in that same inertial attitude. Over.

02 23 13 12 CMP

Roger, Understand.

02 23 13 15 CC

I've got consumables update, when you're ready to copy.

02 23 13 22 CMP

I just got up, but you didn't catch me on that one.

02 23 13 26 CC

I say I have one for you.

02 23 13 55 CMP

Okay. We're ready to copy that consumable update.

02 23 13 59 CC

Roger. As of GET 68 00, RCS total minus 4.5 percent, corresponding to approximately minus 53 pounds. Alfa minus 6.0 percent, minus 1.0 percent, minus 7.0 percent, minus 3.0 percent; H2 total, minus 1.2 pounds; O2 total, plus 10 pounds. Over.

02 23 14 49 CMP

Roger. And our readouts on board are Alfa is 82, Bravo is 84, Cocoa is 84, and Delta is 87.

02 23 15 09 CC

Houston. Roger. Out.

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02 23 15 14 CMP

And you want us to cycle the O2 and H2 fans, I imagine?

02 23 15 24 CC

11, this is Houston. Affirmative. Over.

02 23 15 31 CMP

Okay.

02 23 23 26 LMP

Houston, Apollo 11. I have a status report for you.

02 23 23 34 CC

Go ahead, 11.

02 23 23 38 LMP

Roger. On sleep; CDR, CMP, 7.5; LMP, 6.5. Over.

02 23 23 46 CC
Roger. 7.5 for each. Over.

02 23 23 54 LMP
Negative. LMP 6.5.

02 23 23 59 CC
Roger. 7.5, 7.5 and 6.5. And I got a few words for you here on the SPS engine performance. Over.

02 23 24 14 LMP
Okay. We're ready to listen.

02 23 24 18 CC
Okay, 11. It turns out that the engine performance during both of your burns so far this mission has been the same as it was on engine acceptance tests. The onboard PC reading is due to a known gage calibration factor between what you've actually got in the chamber and what you're reading out on the gage. We expect single bank operation to be 90 - that is, 90 psi on the gage with an actual chamber pressure of 95 psi. In dual bank operation, the chamber pressure is 94 psi on the gage with an actual of 99 psi. 80 psi on the gage on board correlates to 83 psi actual. And we recommend that you stick to an LOI termination cue of 80 psi on the gage. That is, no change to the mission rules. Over.

02 23 25 37 CDR
Apollo 11. Roger. We got all that.

02 23 25 40 CC
Houston. Out.

02 23 33 08 LMP
Houston. Apollo 11.

02 23 33 12 CC
Apollo 11, this is Houston. Go ahead. Over.

02 23 33 25 CC
Apollo 11, this is Houston. Go ahead. Over.

02 23 33 40 CC
Apollo 11, this is Houston. Go ahead. Over.

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02 23 33 47 CDR
Houston, do you read Apollo 11?

02 23 33 49 CC
Roger, 11. We're reading you loud and clear now. We were down in the noise as we switched antennas a minute or so ago. Over.

02 23 34 00 CMP
Roger. What sort of settings could you recommend for the solar corona? We've got the Sun right behind the edge of the Moon now.

02 23 34 12 CC
Roger.

02 23 34 16 LMP
It's quite an erie sight. There is a very marked three dimensional aspect of having the Sun's corona coming from behind the Moon the way it is.

02 23 34 27 CC
Roger.

02 23 34 31 LMP

And it looks as though - I guess what's giving it that three dimensional effect is the earthshine. I can see Tycho fairly clearly - at least if I'm right side up, I believe it's Tycho, in moonshine - I mean, in earthshine. And, of course, I can see the sky is lit all the way around the Moon, even on the limb of it where there's no earthshine or sunshine.

02 23 35 40 CC

Apollo 11, this is Houston. Over.

02 23 35 45 LMP

Go ahead.

02 23 35 47 CC

Roger. If you'd like to take some pictures, we recommend using magazine Uniform which is loaded with high speed black and white film, interior lights off, electric Hasselblad with the 80 millimeter lens. And you're going to have to hand hold us, I guess. We're recommending an f stop of 2.8, and we'd like to get a sequence of time exposures. Over.

02 23 36 24 LMP

Okay. You want magazine Uniform instead of magazine Tango? Over.

02 23 36 30 CC

Roger. We're not trying to get you all wrapped up in a procedure here. This is on a not to interfere basis, of course. Over.

02 23 36 43 LMP

Okay.

02 23 36 46 CC

And on the exposures we're looking for an eighth of a second, a half a second. And, if you think you can steady the camera against anything to get longer exposures, 2 seconds, 4 seconds, and 8 seconds. Over.

02 23 37 11 LMP

Roger. We copy.

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02 23 37 13 CC

Roger. Out.

02 23 39 15 CC

Apollo 11, Houston. Over.

02 23 39 23 CMP

Go ahead, Houston.

02 23 39 25 CC

Roger. We'd like to do a little CRYO tank balancing. So, if you could position the oxygen tank number 1 heater switch to OFF and hydrogen tank 2 heater switch to OFF leaving all the rest of the CRYO switches the same, we'll let it run that way for a few hours. Over.

02 23 39 48 CMP

Okay. Stand by one on those switches. We'll get them in a minute.

02 23 39 51 CC

Roger. And how far out can you see the corona extending? Over.

02 23 40 13 CDR

... bit like zodiacal light. It keeps going out farther and farther. We'll talk about it a little more later.

02 23 40 31 CC

Roger. Out.

02 23 43 11 CDR

... We've got quite a few pictures ...

02 23 44 06 CC

Apollo 11, this is Houston. I think we have COMM again. We heard you calling. Over.

02 23 44 27 CC

Apollo 11, this is Houston. Were you calling? Over.

02 23 44 48 CMP

Houston, Apollo 11. Understand you want the heaters OFF for hydrogen tank 1 and oxygen tank 1. Is that affirmative?

02 23 44 56 CC

That's negative, Mike. Hydrogen tank number 2 heaters OFF and oxygen tank number 1 heaters OFF.

02 23 45 05 CMP

Okay.

02 23 45 07 CC

Roger. Out.

02 23 45 12 CMP

I have hydrogen tank number 2 heaters OFF; I have oxygen tank number 1 heaters OFF.

02 23 45 18 CC

Roger. Out.

02 23 52 15 CMP

Houston. Apollo 11. The earthshine coming through the window is so bright you can read a book by it.

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02 23 52 24 CC

Oh, very good.

02 23 56 00 CDR

And, Houston, I'd suggest that along the ecliptic line we can see the corona light out to two lunar diameters from this location. The bright light only extends out about an eighth to a quarter of the lunar radius.

02 23 56 35 CC

Roger. Understand that you can see the corona approximately 200 solar diameters out along the ecliptic, and the bright light extends out approximately one eighth to one quarter lunar radius. Over.

02 23 56 52 CDR

That's two lunar - two lunar diameters along the ecliptic in the bright part, right; a quarter to an eighth of a lunar radius out, and that's perpendicular to the ecliptic line on the South Pole.

02 23 57 07 CC

Roger.

02 23 59 20 CDR

Houston, it's been a real change for us. Now we are able to see stars again and recognize constellations for the first time on the trip. It's - the sky is full of stars. Just like the nightside of Earth. But all the way here, we have only been able to see stars occasionally and perhaps through the monocular, but not recognize any star patterns.

02 23 59 52 CC

I guess it has turned into night up there really, hasn't it ?

02 23 59 58 CDR

Really has.

03 00 04 57 CC

11, this is Houston. Go ahead. Over.

03 00 13 48 CC

Apollo 11, this is Houston. Do you read? Over.

03 00 14 38 CC

Apollo 11, this is Houston. How do you read? Over.

03 00 14 43 CDR

Okay. We went to HIGH GAIN. Looks like you had a little trouble getting signal strength there.

03 00 14 49 CC

Roger. We missed an OMNI switch there. Over.

03 00 14 55 CDR

All right. On the secondary loop check when we went to FLOW on the secondary radiators, the quantity dropped from 40 per-cent down to 36 in the first 10 seconds and then stabilized at 36 for the remainder of the 30 seconds.

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03 00 15 30 CC

Apollo 11, this is Houston. We believe that is normal system operation. The radiators are expected to be very cold right now and apparently the decrease you saw was due to contraction in the fluid. Over.

03 00 15 49 CDR

Okay. We will go ahead with the procedure just as if there were no decrease in accumulator quantity. Right?

03 00 15 55 CC

Roger. Press on.

END OF TAPE

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03 00 17 25 CDR

And, Houston, the secondary radiator flow check is complete and satisfactory.

03 00 17 31 CC

Houston. Roger. Out.

03 00 17 40 CMP

And that's a good deal because we don't have to have any meetings about whether we're going to do it or don't do it any more.

03 00 17 47 CC

That's for sure.

03 00 18 00 CC

The Flight Director says "ouch."

03 00 18 12 CMP

No. No "ouch" intended. I enjoyed every one of those meetings.

03 00 19 10 CC

11, this is Houston. I have your pericynthion plus 2 PAD, P30 format; when you're ready to copy.

03 00 19 24 CDR

Roger. Stand by.

03 00 20 17 LMP

Houston, Apollo 11. Ready to copy pericynthion plus 2.

03 00 20 24 CC

Apollo 11, this is Houston. Pericynthion plus 2 hours PAD. SPS G&N: 62710, plus 098, minus 019, GET ignition 077 46 2248, DELTA-VX NOUN 81, plus 32148, minus 00455, minus 10377, roll NA, pitch 307, and the remainder of the PAD is NA. GDC align stars Vega and Deneb. Roll 243 183 012, no ullage. Remarks: Assumes landing site REFSMMAT and docked. Over.

03 00 21 48 LMP

Roger. SPS G&N: 62710, plus 098, minus 019, 077 46 2248, plus 32148, minus 00455, minus 10377, NA, 307, Vega and Deneb, 243 183 012, no ullage, landing site REFSMMAT, docked. And I need a change on the LM weight. Over.

03 00 22 30 CC

No change in the LM's weight - in the LM weight, and the readback is correct. Out.

03 00 25 06 CC

Apollo 11, this is Houston. Over.

03 00 25 13 CDR

Roger. Go ahead.

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03 00 25 14 CC

Roger. We're having difficulty getting commands into the spacecraft. We'd like you to cycle your UP TELEMETRY switch to COMMAND RESET and OFF and then back to NORMAL. Over.

03 00 25 32 CDR

Okay. We'll do it.

03 00 25 50 CDR

We have you on high gain right now. You want us to switch over to OMNI?

03 00 26 02 CC

Negative. We Would like to stay on the high gain if we can. Over.

03 00 26 11 CDR

Okay.

03 00 27 16 CC

Apollo 11, this is Houston. Over.

03 00 27 24 CDR

Go ahead.

03 00 27 25 CC

Roger. We'd like you to switch to OMNI Delta as we show you approximately at the scan limit of the high gain antenna. Now we will then command OMNI Delta down here after you advise us you've switched, and then you can select Bravo on board and we will be back in the OMNI antenna commanding business. Over.

03 00 27 46 CDR

Okay. We're going to Delta now.

03 00 28 16 CC

11, Houston. You can go ahead and select OMNI Bravo on board now.

03 00 28 24 CDR

...

03 00 28 27 CC

Roger. Out.

03 00 29 24 CC

Apollo 11, this is Houston. If you have a minute or so free, we can read you up the morning news here.

03 00 29 35 CDR

Go right ahead; let's hear it.

03 00 29 37 CC

Roger. Hot from the wires of the MSC Public Affairs Office, especially prepared for the crew of Apollo 11.

03 00 29 46 CC

Okay. First off, it looks like it's going to be impossible to get away from the fact that you guys are dominating all the news back here on Earth. Even Pravda in Russia is headlining the

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mission and calls Neil, "The Czar of the Ship." I think maybe they got the wrong mission.

03 00 30 06 CC

West Germany has declared Monday to be "Apollo Day." School children in Bavaria have been given the day off. Post Office clerks have been encouraged to bring radios to work and Frankfurt is installing TV sets in public places.

03 00 30 24 CC

BBC in London is considering a special radio alarm system to call people to their TV sets in case there is a change in the EVA time on the Moon.

03 00 30 35 CC

And in Italy, Pope Paul VI has arranged for a special color TV circuit at his summer residence in order to watch you, even though Italian television is still black and white.

03 00 30 48 CC

Back here in Houston, your three wives and children got together for lunch yesterday at Buzz's house. And according to Pat, it turned out to be a gabfest. The children swam and did some high jumping over at Buzz's bamboo pole.

03 00 31 11 CC

In Moscow, space engineer Anatol Koritsky was quoted by TASS as saying that Luna 15 could accomplish everything that has been done by earlier Luna spacecraft. This was taken by the press to mean Luna 15 could investigate the gravitational fields, photograph the Moon, and go down to the surface to scoop up a bit for analysis.

03 00 31 35 CC

Even the kids at camp got into the news when Mike Jr. was quoted as replying "yeah" when somebody asked him if his daddy was going to be in history. Then after a short pause he asked, "What is history?" In Washington, President Nixon is planning to use his executive power to streamline the Interstate Commerce Commission. According to industry sources, it was reported Nixon would trim the commission from 11 to 7 members by not making new appointments.

03 00 32 12 CC

And the big news around Houston today concerns the Astros. In the sports world, the Houston Astros rallied in the ninth inning at Cincinnati to dump the Reds 7 to 4. Going into the ninth however, things looked pretty bleak. The Astros were trailing 4 to 3. Then with one out, Jesus Alou stroked a single to right field. John

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Edwards hit another single to right, and Sandy Valdespino hit a double to bring in the tying run. Julio Gotay was walked and Joe Morgan dropped a bunt for the game winning play. A wild throw to the plate allowed another run to score, then a sacrifice fly by Dennis Menke brought in the final run. They really came through in the ninth.

03 00 32 56 CC

And other games in the National League - -

03 00 32 57 CMP

Yes. Those Astros have really been catching those flies since they put a roof on the stadium.

03 00 33 05 CC

Good work.

03 00 33 19 CC

In other games in the National League, New York beat Montreal 5 to 2; Pittsburgh beat St. Louis 4 to 1; and Atlanta over San Diego in the first game of a double header 6 to 2.

03 00 33 32 CC

In the American League, Detroit beat Cleveland 4 to nothing; New York trounced Washington 5 to nothing; Baltimore outhit - Boston outhit Baltimore to score 6 runs to the Orioles' 2; and Chicago beat Kansas City 6 to 1.

03 00 33 50 CC

Okay. In golf world, Tommy Jacobs, an infrequent competitor in recent years, took the lead in the Philadelphia Golf Classic yesterday. His second round score was 139.

03 00 34 02 CC

You might be interested in knowing, since you are already on the way, that a Houston astrologer, Ruby Graham, says that all the signs are right for your trip to the Moon. She says that Neil is clever, Mike has good judgment, and Buzz can work out intricate problems. She also says Neil tends to see the world through rose colored glasses, but he is always ready to help the afflicted or distressed. Neil, you are also suppose to have "intuition that enables you to interpret life with feeling." Buzz is to be very sociable and cannot bear to be alone in addition to having excellent critical ability. Since she didn't know at what hour Mike was born, she has decided that he either has the same attributes as Neil or he is inventive with an unconventional attitude that might seem eccentric to the unimaginative.

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03 00 34 56 CC

And last but not - -

03 00 34 58 CMP

Who said all that?

03 00 35 00 CC

(Laughter) Ruby Graham, an astrologer here in Houston. Now we check with Flight Operations for all the signs for the mission, and then we, of course, had to make sure that everything was really all set.

03 00 35 49 CDR

Houston, 11. You're cutting out ...

03 00 35 56 CC

Apollo 11, Apollo 11, this is Houston. We're switching OMNI's. Can you stand by for about 2 minutes?

03 00 37 30 CDR

Houston, 11. Radio check.

03 00 37 35 CC

11, Houston. Go ahead.

03 00 37 41 CDR

Roger. You cut out after Tommy Jacobs. I guess we got into antenna switching problems.

03 00 37 49 CC

Okay. Following Tommy Jacobs, we have the hot smoking word from a local Houston astrologer by the name of Ruby Graham. She says that all the signs are right for your trip to the Moon. Neil is clever, Mike has good judgment, and Buzz can work out intricate problems. She also says Neil tends to see the world through rose colored glasses but is always ready to help the afflicted or distressed. Neil, you are also supposed to have "intuition that enables you to interpret life with feeling," Buzz is supposed to be very sociable and cannot bear to be alone in addition to having excellent critical ability. Since she didn't know at what hour Mike was born, she decided he either has the same attributes as Neil or that he is inventive with an unconventional attitude that might seem eccentric to the unimaginative. And that's 30 for today. Over.

03 00 38 51 CDR

Thank you much there, Bruce and Fred Show, we appreciate that.

03 00 38 58 CC

Roger.

03 00 39 13 CMP

Did you hear our comment about the Astros?

03 00 39 17 CC

The one about the roof?

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03 00 39 23 CMP

Yes.

03 00 39 44 CC

Hey, Mike, the game was at Cincinnati there, and we think that they're still using Crosby Field up there. I don't believe it has a roof on it.

03 00 40 00 CDR
You got him on that one.

03 00 40 02 CC
Right - -

03 00 40 03 CDR
I think they're just getting to be a good team in the clinch.

03 00 40 05 CC
They certainly seem to be.

03 00 40 11 CMP
Well, if they can do that well without a roof, think of what they're going to do with a roof.

03 00 40 16 CC
Roger. Out.

03 00 40 21 CMP
We're trying.

03 00 40 41 CDR
An old Oiler fan is trying to comment on an alien game.

03 00 41 23 CMP
You tell Michael Jr., history or no history, he'd better behave himself.

03 00 41 29 CC
Roger. We'll pass that along, Mike.

03 00 48 58 CC
Apollo 11, Houston. If it's convenient with you, we have an LOI 1 PAD that we can pass up to you now. Over.

03 00 49 10 CDR
Stand by.

03 00 49 17 CMP
Houston, Apollo 11. The next time we pass through roll 0, we're going to stop PTC and that will give us 90 degrees pitch. Now, I understand you want us to move from 90 degrees pitch to 0 degrees pitch for the platform align, option 1. Is that affirmative?

03 00 49 42 CC
Standby, please.

03 00 49 47 CDR
And we are ready to copy on the LOI 1.

03 00 50 37 CC
Apollo 11, this is Houston. When you stop at 0 roll, you will be in approximately 90 pitch, 0 yaw, and 0 roll. We'd like you to run the

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first P52, that is, the P52 option 3, from that attitude. Then we'll uplink you a new REFSMMAT, either before or while you are maneuvering to 000, and then you can torque the platform around and run the second REFSMMAT. Over. Run the second P52. Over.

03 00 51 13 CMP
Okay.

03 00 51 15 CC

And I copied you are ready for the LOI 1 pad. Over.

03 00 51 22 CDR

Go ahead.

03 00 51 24 CC

LOI 1, SPS G&N: 62710, plus 098, minus 019, GET ignition 075 49 4965, minus 28897, minus 03944, minus 00686. Roll 358, pitch 226, 347; 01692, plus 00610; 29173 602 29108; sextant star 31 1066 358. Remainder of the PAD is NA. GDC align Vega and Deneb 243 183 012. No ullage. The horizon will be visible just below the upper edge of the hatch window 2 minutes prior to the LOI burn. It will not be visible in the rendezvous window on the left hand side. LOS at 75 hours 41 minutes 23 seconds. AOS at 76 15 29. AOS without the LOI burn 76 05 30. The values which you would see on NOUN 42 prior to LOI burn are HA plus 431.3, HP minus 128.2. Readback. Over.

03 00 53 54 CDR

Roger. LOI 1, SPS G&N: 62710, plus 098, minus 019, 075 49 4965, minus 28897, minus 03944, minus 00686; 358 226 347; 01692, plus 00610; 29173 602 29108; 31 106.6 358. GDC align Vega and Deneb 243 183 012. No ullage. Horizon in the hatch window 2 minutes before TIG. AOS with an LOI 76 15 29. AOS without an LOI 76 05 30. HA before the burn 431.3, HP minus 128.2. Say again LOS time.

03 00 55 47 CC

Roger. LOS time 75 41 23. Over.

03 00 55 58 CDR

Understand 75 41 23.

03 00 56 03 CC

11, this is Houston. Readback correct. Out.

03 01 04 38 CC

Apollo 11, this is Houston. Over.

03 01 04 43 LMP

Go ahead.

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03 01 04 44 CC

Roger. Apparently we missed getting your onboard readouts on battery Charlie and PYRO batteries Alfa and Bravo last night. I wonder if you could give us some fresh numbers. Over.

03 01 04 59 LMP

You want the readings now?

03 01 05 01 CC

Yes, please. If it's convenient for you.

03 01 05 16 LMP

Okay. All three of them are still 37.1.

03 01 05 20 CC

Roger. 37.1 cubed. Out.

03 01 09 14 CMP

Houston, Apollo 11. The P52 option 3 is complete. We're maneuvering to 000.

03 01 09 20 CC

Roger. We observe your maneuvering, and we'll have some uplinks for you in a couple of minutes here.

03 01 09 27 CMP

Okay.

03 01 13 13 CC

Apollo 11, this is Houston. We observe you're in P00. If you'll give us ACCEPT, we'll start our uplinks.

03 01 13 24 CMP

You've got it, Houston.

03 01 13 25 CC

Roger. Out.

03 01 16 51 CC

Apollo 11, this is Houston. Over.

03 01 16 58 CDR

Go ahead, Houston.

03 01 16 59 CC

Roger. We're on low bit rate at the present time so it's going to take us a little bit longer than normal to get this stuff up to you. Over.

03 01 17 12 CDR

I guess we're in no rush.

03 01 17 15 CC

Okay. We're here if you're there.

03 01 17 24 CDR

The view of the Moon that we've been having recently is really spectacular. It fills about three quarters of the hatch window, and of course, we can see the entire circumference, even though part of it is in complete shadow and part of it's in earthshine. It's a view worth the price of the trip.

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03 01 17 45 CC

Well, there are a lot of us down here that would be willing to come along.

03 01 17 58 CMP

I hope you get your turn, and soon.

03 01 18 11 CDR

One of these days, we'll be able to bring the whole MOCR along, I hope. Save a lot of antenna switching.

03 01 18 21 CC

Say again, 11.

03 01 18 26 CDR

One of these days, we could bring the whole MOCH along, and then that'll save a lot of antenna switching.

03 01 18 34 CC

That's Jolly.

03 01 20 21 CC

Apollo 11, this is Houston. Over.

03 01 20 28 CMP

Go ahead, Houston.

03 01 20 30 CC

11, this is Houston. We're showing you - -

03 01 20 32 CMP

The Czar is brushing his teeth, so I'm filling in for him.

03 01 20 36 CC

Say again, please.

03 01 20 42 CMP

I said the Czar is brushing his teeth, so I'm filling in for him. What can we do for you?

03 01 20 47 CC

Roger. If you don't get in the way of the Czar while he's brushing his teeth, we'd like you to bring up the primary accumulator quantity a little bit. We're showing the quantity now at 20.6 percent on TM. Seems to have gone down a bit since you've gone into the shadow. We'd like it serviced to bring the quantity up to between 30 and 40 percent, preferable 35 percent. Over.

03 01 21 19 CMP

Okay.

03 01 21 23 CC

The computer is yours, 11. The loads are in and verified. You can go back to BLOCK.

03 01 21 31 CMP

We're in BLOCK.

03 01 23 52 CC

11, this is Houston. On the basis of your last P52 alignment, the platform looks like it's indeed performing very well. No problems there,

Tape 47/10 — Page 212

no updates required, and no PIPA bias update is required either. Over.

03 01 24 12 CMP

Sounds good.

03 01 40 51 CMP

Houston, Apollo 11. Radio check.

03 01 40 54 CC

11, this is Houston. Loud and clear. Over.

03 01 41 00 CMP

Okay. Just checking. Do you want high gain?

03 01 41 06 CC

Roger. If you can give it to us.

03 01 41 11 CMP

Okay.

03 01 42 19 CMP

Houston, Apollo 11. How do you read on the high gain?

03 01 42 23 CC

Loud and clear on the high gain.

03 01 42 29 CMP

Same here. We've completed the P52 option 1.

03 01 42 36 CC

Roger. We've been looking over your shoulder by TM.

03 01 42 48 CMP

Glad to have you.

END OF TAPE

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03 01 58 37 LMP

Houston, Apollo 11. Standing by to copy TEI 1 and TEI 4. Over.

03 01 58 43 CC

Roger. I've got the 1 and 4 PAD's here, right now. I'll be ready to read them up to you in just a second.

03 01 59 31 CC

11, this is Houston. I'm ready with the TEI 1 and 4 PAD's. Over.

03 01 59 44 LMP

Ready to copy.

03 01 59 46 CC

Roger. TEI 1, SPS G&N: 38658, minus 054, plus 065, TIG 078 02 0345, plus 29180, plus 03779, minus 01325; roll NA, pitch 041. The balance of the PAD is NA. Ullage two jets, 19 seconds. TEI 4 PAD, SPS G&N: 38658, minus 054, plus 065, TIG 084 29 5059, plus 31373, plus 03760, minus 00968; roll NA, pitch 034. The rest of the PAD is NA. Ullage two jets, 19 seconds. Both of these PAD's are for an undocked maneuver. TEI plus 4 PAD assumes no LOI-2. Over. Make that TEI 4 PAD assumes no LOI-2.

03 02 01 53 LMP

Roger. TEI 1, SPS G&N: 38658, minus 054, plus 065, 078 02 0345, plus 29180, plus 03779, minus 01325; roll NA, pitch 041; two jets, 19 seconds, undocked. TEI 4: 38658, minus 054, plus 065, 084 29 5059, plus 31373, plus 03760, minus 00968; roll NA, pitch 034; two jets, 19 seconds, undocked; assumes no LOI-2.

03 02 02 59 CC

11, this is Houston - -

03 02 03 00 LMP

- - Apollo 11. Over.

03 02 03 01 CC

- - 11, this is Houston. Readback correct. Out.

03 02 04 24 CC

11, this is Houston. Over.

03 02 04 30 LMP

Roger. Go ahead, Houston.

03 02 04 32 CC

Roger. At GET of 74 30, we'd like you to cycle the fans in all four CRYO tanks and position the heaters in all four CRYO tanks to the AUTO position. We're doing this in advance of LOI in order to insure that you don't have any destratification as a result of the burn, which might result in giving you a master caution and warning during the burn. Over.

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03 02 05 08 LMP

Okay. Was that 74 30? You want us to cycle the heaters and turn - cycle the fans and turn all the heaters on.

03 02 05 16 CC

All the heaters to AUTO; cycle the fans at 74 30, about 25 minutes from now. Over.

03 02 05 23 LMP

Okay.

03 02 34 44 CC

11, this is Houston. Radio check. Over.

03 02 34 49 CDR

Houston, 11.

03 02 34 51 CC

Roger. Loud and clear now.

03 02 35 10 CDR

Houston, Apollo 11.

03 02 35 12 CC

Go ahead, 11.

03 02 35 20 CDR

Apparently this is not a very good OMNI attitude for you. We're ready to start our PTC check.

03 02 35 52 CC

11, this is Houston. We're ready, except that we'd like to get the high gain antenna prior to this test. Over.

03 02 36 06 CDR

Can you give us a couple of pointing angles?

03 02 36 09 CC

Roger. From an attitude with 60 degrees roll, around to an attitude of roll 058 inertial. It would be pitch plus 30 and yaw 270 on the high gain antenna.

03 02 36 27 CDR

Thank you.

03 02 51 01 CC

Apollo 11, Apollo 11, this is Houston. Radio check. Over.

03 02 51 13 CC

Apollo 11, Apollo 11, this is Houston. Radio check. Over.

03 02 51 36 CC

Apollo 11, this is Houston. Do you read? Over.

03 02 51 43 CDR

Roger. Loud and clear.

03 02 51 45 CC

Roger. We're reading you weak but clear.

03 02 51 52 CDR

Roger. We put our - our roll for MSFN track in on the wrong side. Going to continue rolling around until we get high gain here. And, we'll

Tape 48/3 — Page 215

delete the - the pitch that was scheduled after the TVC check.

03 02 52 15 CC

Say again please, 11.

03 02 52 20 CDR

Roger. We put the wrong sign in - -

03 02 52 24 CC

Roger.

03 02 52 25 CDR

- - for the roll correction to get MSFN high gain, and we're continuing rolling around to get the proper attitude for high gain at this time. We will delete the pitch maneuver that was scheduled subsequent to - subsequent to the TV check since we already have those pictures.

03 02 52 46 CC

Roger. We copy. And we recommend that you go ahead and complete your TVC test on board. If you have problems, we'll talk to you when you get around further into the high gain antenna attitude. Over.

03 02 53 12 CDR

Roger.

03 02 58 59 CDR

Houston, how do you read on high gain?

03 02 59 02 CC

Oh, loud and clear on high gain, 11.

03 02 59 07 CDR

Roger. We're proceeding.

03 02 59 09 CC

Roger.

03 03 03 22 CC

Apollo 11, this is Houston. We observed your gimbal test down here, and it looked good to us. Over.

03 03 03 32 CDR

Roger. It looked good here.

03 03 18 49 CC

Apollo 11, this is Houston. Radio check. Over.

03 03 18 55 CMP

Loud and clear.

03 03 18 56 CC

Roger. And your systems are looking good from down here.

03 03 19 02 CM

Yes. Looks good up here too, Bruce.

END OF TAPE

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03 03 30 38 CC

Apollo 11, this is Houston. Over.

03 03 30 44 LMP

Roger. Go ahead Houston, Apollo 11.

03 03 30 46 CC

11, this is Houston. You are GO for LOI. Over.

03 03 30 53 LMP

Roger. GO for LOI.

03 03 30 55 CC

And we're showing about 10 minutes and 30 seconds to LOS. I would like to remind you to enable the BD roll on the AUTO RCS switches. Over.

03 03 31 09 LMP

Roger. And confirm you want PCM low going over the hill. Over.

03 03 31 18 CC

That's affirmative, 11.

03 03 31 24 LMP

Roger.

03 03 31 43 LMP

If you want to, I'll put it back to high until just before LOS. Over.

03 03 31 51 CC

Negative, 11. Low is okay for now. Over.

03 03 31 57 LMP

Roger.

03 03 35 55 CDR

Houston, do you want to give me a time check, please?

03 03 35 58 CC

Roger. I'll give you a Mark at 13 minutes and 30 seconds to ignition.

03 03 36 11 CDR

Okay. And then a GET, please.

03 03 36 16 CC

Stand by a minute.

03 03 36 18 CDR

Okay.

03 03 36 41 CC

I'll give you a time hack on the GET at 75 hours 37 minutes and I'll try that bias at about a second and a half to allow for the time of flight.

03 03 36 55 CDR

Okay.

03 03 36 57 CC

Stand by.

03 03 37 01 CC
MARK.

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03 03 37 02 CC
75 hours 37 minutes GET.

03 03 37 07 CDR
Thank you.

03 03 37 12 CC
And I'll give you a time hack on time to ignition at 12 minutes to ignition. Over.

03 03 37 22 CDR
Okay.

03 03 37 44 CC
Stand by for a Mark at TIG minus 12.

03 03 37 51 CC
MARK.

03 03 37 52 CC
TIG minus 12.

03 03 37 56 CDR
You were right on, Bruce. Thank you.

03 03 37 58 CC
Roger. Out.

03 03 39 29 CC
Two minutes to LOS.

03 03 40 33 CC
Apollo 11, this is Houston. All your systems are looking good going around the corner, and we'll see you on the other side. Over.

03 03 40 42 CDR
Roger.

03 03 40 49 CDR
Everything looks okay up here.

03 03 40 51 CC
Roger. Out.

03 04 02 -- BEGIN LUNAR REV 1

03 04 15 47 CC
Apollo 11, Apollo 11, this is Houston. Do you read? Over.

03 04 15 59 CC
Apollo 11, Apollo 11, this is Houston. Do you read? Over.

03 04 16 11 SC
...

03 04 16 59 SC
Houston, Apollo 11. Over.

03 04 17 00 CC
Apollo 11, Apollo 11, this is Houston. We are reading you weakly. Go ahead. Over.

03 04 17 08 CDR
Roger. Burn status report follows. DELTA-TIG zero, burn time 557, ... VGX minus 0.1, VGY

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minus 0.1, VGZ plus 0.1, DELTA-VC minus 0.390, fuel, plus 3 ... 42. Over.

05 04 17 44 CC
11, this is Houston. These residuals, do you have minus 0.1?

03 04 17 50 SC
... VGX minus 0.1, VGY minus 0.1, VGZ 1.1, and a burn time of 5 plus 57. Stand by, maybe the COMM will improve a little bit. Over.

03 04 19 32 CC
Apollo 11, this is Houston. Are you in the process of acquiring data on the burn? Over.

03 04 21 37 CC
Apollo 11, Apollo 11, this is Houston. How do you read?

03 04 21 43 CDR
Reading you loud and clear, Houston. How us?

03 04 21 46 CC
Roger. Reading you the same, now. Could you repeat your burn status report? We copied the residuals and burn time, and that was about it. Send the whole thing again, please.

03 04 21 56 CDR
It was like - like perfect! DELTA-TIG zero, burn time 557, shaft value on the angles, VGX minus 0.1, VGY minus 0.1, VGZ plus 0.1, no trim, minus 6.8 on DELTA-VC, fuel was 38.8, LOX 39.0, plus 50 on balance, and we ran an increase on the PUGS, NOUN 44 showed us in a 60.9 by 169.9.

03 04 22 35 CC
Roger. We copy your burn status report. And the spacecraft is looking good to us on telemetry.

03 04 22 47 CDR
Everything looks good up here.

03 04 34 34 CDR
Apollo 11 is getting its first view of the landing approach. This time we are going over the Taruntius crater, and the pictures and maps brought back by Apollo 8 and 10 have given us a very good preview of what to look at here. It looks very much like the pictures, but like the difference between watching a real football game and watching it on TV. There's no substitute for actually being here.

03 04 35 11 CC
Roger. We concur, and we surely wish we could see it firsthand, also.

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03 04 35 32 LMP

We're going over the Messier series of craters right at the time, looking vertically down on them, and Messier A we can see good sized blocks in the bottom of the crater. I don't know what our altitude is now, but in any case, those are pretty good size blocks.

03 04 35 56 CC

Okay. Just roughly, it looks like you are about 120 miles or 130 miles right now - make that 127 miles.

03 04 37 12 CDR

We're approaching PDI point now. Over.

03 04 37 24 CDR

There's Secchi in sight.

03 04 37 48 LMP

We're going over Mount Marilyn at the present time, and it's ignition point.

03 04 37 55 CC

Roger. Thank you. And our preliminary tracking data for the first few minutes shows you in a 61.6 by 169.5 orbit. Over.

03 04 38 10 LMP

Roger.

03 04 38 13 CC

And Jim is smiling.

03 04 41 29 CC

Apollo 11, this is Houston. Over.

03 04 41 35 CDR

Go ahead.

03 04 41 37 CC

11, Houston. During your SPS burn as played back on tape down here, we've observed the nitrogen tank Bravo pressure in the SPS system dropping a little bit more than we anticipated. It's holding steady right now. We'll continue to watch it and keep you posted if anything comes up. Over.

03 04 42 03 CDR

Roger. Thank you.

03 04 42 04 CC

Right. And it has held steady - -

03 04 42 05 CDR

Currently going over Maskelyne Mas -

03 04 42 10 CDR

Okay.

03 04 42 11 CDR

And Boothill, Duke Island, Sidewinder, looking at Maskelyne W, that's the yaw round checkpoint, and just coming into the terminator. At the terminator it's ashen and gray. As you get further away from the terminator, it gets to be

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a lighter gray, and as you get closer to the subsolar point, you can definitely see browns and tans on the ground, according to the last Apollo 11 observation anyway.

03 04 42 49 CC

Roger, 11. We're recording your comments for posterity.

03 04 42 57 CDR

(Laughter) Okay.

03 04 43 04 CMP

Did somebody in the background - do they accuse us of being compromisers? Huh!

03 04 43 19 CDR

And landing site is well into the dark here. I don't think we're going to be able to see anything of the landing site this early.

03 04 43 42 CC

Apollo 11, this is Houston. When you have a free minute, could you give us your onboard readout of N2 tank Bravo, please. And we'd like to make sure you understand that ever since you stopped thrusting with the SPS, the temperature in this tank has remained steady. Over. Make that the pressure has remained steady.

03 04 44 07 CMP

Roger. We understand tank pressure has stayed steady. Thank you.

03 04 44 12 LMP

Roger. We're showing the N2 tank pressure and the tank Bravo to be 1960, something like that, and Alfa is, oh, about 2250. Over.

03 04 44 34 CC

Roger. We show 2249 in Alfa and 1946 down here.

03 04 44 44 LMP

All right.

03 04 53 19 CMP

Houston, Apollo 11. How about coming up with some roll, pitch, and yaw angles in which to stop this so called ORB RATE that I'm doing.

03 04 53 28 CC

Roger. Standby.

03 04 53 45 CC

We'll have them for you in a minute, 11.

03 04 53 51 CMP

Okay. And time to stop also, please.

03 04 53 55 CC

Yes, indeed.

03 04 56 35 CC

Apollo 11, this is Houston. Over.

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03 04 56 41 CDR

Go ahead, Houston.

03 04 56 42 CC

Roger. We show you, in the flight plan, staying in orbital rate until about 79 hours 10 minutes. Do you have some particular attitude or reason for wanting to go inertial? Over.

END OF TAPE

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03 04 57 00 LMP

No, that's fine. I just wanted to confirm that. Until 79 10, then we'll breeze around here in orbit.

03 04 57 07 CC

Roger. And we've got an observation you can make if you have some time up there. There's been some lunar transient events reported in the vicinity of Aristarchus. Over.

03 04 57 28 LMP

Roger. We just went into spacecraft darkness. Until then, why, we couldn't see a thing down below us. But now, with earthshine, the visibility is pretty fair. Looking back behind me, now, I can see the corona from where the Sun has just set. And we'll get out the map and see what we can find around Aristarchus

03 04 57 54 CDR

We're coming upon Aristarchus right now - -

03 04 57 55 CC

- - Okay. Aristarchus is at angle Echo 9 on your ATO chart. It's about 394 miles north of track. However, at your present altitude, which is about 167 nautical miles, it ought to be over - that is within view of your horizon: 23 degrees north, 47 west. Take a look and see if you see anything worth noting up there. Over.

03 04 58 34 CDR

Both looking.

03 04 58 36 CC

Roger. Out.

03 05 03 01 LMP

Houston, 11. It might help us a little bit if you could give us a time of crossing of 45 west.

03 05 03 09 CC

Say again, please, 11.

03 05 03 23 LMP

You might give us a time of crossing of 45 west, and then we'll know when to start searching for Aristarchus.

03 05 03 32 CC

Roger. You'll be crossing 45 west at 77 04 10 or about 40 seconds from now. Over. Thirty seconds from now.

03 05 03 45 LMP

Okay.

03 05 04 50 CC

Apollo 11, when we lose the S-band, we'd like to get OMNI Charlie from you. And update my last, that 77 04 was the time when Aristarchus should

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become visible over your horizon. 77 12 is point of closest approach south of it. Over.

03 05 05 14 LMP

Okay. That sounds better because we just went by Copernicus a little bit ago.

03 05 05 18 CC

Roger. We show you at about 27 degrees longitude right now.

03 05 05 25 LMP

Righto.

03 05 07 07 LMP

Houston, when a star sets up here, there's no doubt about it. One instant it's there, and the next instant it's just completely gone.

03 05 07 16 CC

Roger. We copy.

03 05 09 21 CC

Apollo 11, this is Houston. We request you use OMNI Charlie at this time. Over.

03 05 09 29 LMP

Okay. Going to OMNI Charlie.

03 05 09 32 CC

Roger. Out.

03 05 11 57 LMP

Houston, Apollo 11.

03 05 12 01 CC

Apollo 11, this is Houston. Go ahead.

03 05 12 06 LMP

Roger. Seems to me since we know orbits so precisely, and know where the stars are so precisely, and the time of setting of a star or a planet to so very fine a degree, that this might be a pretty good means of measuring the altitude of the horizon ...

03 05 12 32 CC

Roger.

03 05 12 51 CMP

Hey, Houston. I'm looking north up toward Aristarchus now, and I can't really tell at that distance whether I am really looking at Aristarchus, but there's an area that is considerably more illuminated than the surrounding area. It just has - seems to have a slight amount of fluorescence to it. A crater can be seen, and the area around the crater is quite bright.

03 05 13 30 CC

Roger, 11. We copy.

03 05 14 23 LMP

Houston, Apollo 11. Looking up at the same area now and it does seem to be reflecting some of the earthshine. I'm not sure whether it was worked

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out to be about zero phase to - Well, at least there is one wall of the crater that seems to be more illuminated than the others, and that one - if we are lining up with the Earth correctly, does seem to put it about at zero phase. That area is definitely lighter than anything else that I could see out this window. I am not sure that I am really identifying any phosphorescence, but that definitely is lighter than anything else in the neighborhood.

03 05 15 15 CC

11, this is Houston. Can you discern any difference in color of the illumination, and is that an inner or an outer wall from the crater? Over.

03 05 15 34 CMP

Roger. That's an inner wall of the crater.

03 05 15 43 LMP

No, there doesn't appear to be any color involved in it, Bruce.

03 05 15 47 CC

Roger. You said inner wall. Would that be the inner edge of the northern surface?

03 05 16 00 CMP

I guess it would be the inner edge of the westnorthwest part, the part that would be more nearly normal if you were looking at it from the Earth.

03 05 16 20 CC

11, Houston. Have you used the monocular on this? Over.

03 05 16 28 LMP

Stand by one.

03 05 17 59 LMP

Roger. Like you to know this quest for science has caused me to lose my E memory program, it's in here somewhere, but I can't find it.

03 05 18 08 CC

11, this is Houston. We're - we're hearing only a partial COMM. Say again please.

03 05 18 20 CDR

I think ...

03 05 18 41 CDR

Houston, we will give it a try if we have the opportunity on next - when we are not in the middle of lunch, and trying to find the monocular.

03 05 18 51 CC

Roger. Copied you that time. Expect in the next REV you will probably be getting ready for LOI 2.

03 05 19 09 CC

So, let's wind this up, and since we've got some other things to talk to you about in a few minutes. Over.

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03 05 19 19 LMP

Okay.

03 05 22 44 CC

Apollo 11, this is Houston. Over.

03 05 22 49 CMP

Go ahead, Houston.

03 05 22 53 CC

11, this is Houston. We're targeting - planning to make the LOI 2 burn now using bank A only. We'll have the PAD and everything for you next time around. Just trying to economise a little on bank B. Bank B is holding, though.

03 05 23 15 CMP

Roger. Understand.

03 05 31 53 CC

Apollo 11, this is Houston. Over.

03 05 32 02 CDR

Go ahead.

03 05 32 04 CC

11, Houston. In order to improve the communications a little bit here, we'd like to try to get you on the high gain antenna. We're recommending a pitch angle of 0, yaw 355 - I say again 355, the track switch to MANUAL, and wide beamwidth. Over.

03 05 32 42 CDR

Okay. You ready to switch to high gain now?

03 05 32 45 CC

That's affirmative.

03 05 33 09 CC

11, Houston. Do you read?

03 05 33 19 CDR

Roger. We read you. It seems to be rather marginal on the high gain.

03 05 33 24 CC

Roger. We concur.

03 05 33 42 LMP

Houston, Apollo 11. Could you give us a time of crossing the prime meridian 150 west? Over.

03 05 33 47 CC

Roger. Stand by about a half a second, here. Okay. Your time of crossing the 150 west meridian will be 77 50 05. Over.

03 05 34 10 LMP

Thank you.

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03 05 34 24 CC

11, this is Houston. We have about 6 minutes remaining until LOS, and in order that we may configure our ground lines, we'd like to know if you're still planning to have the TV up with the beginning of the next pass. Over.

03 05 34 48 CDR

Roger, Houston. We'll try to have it ready.

03 05 34 50 CC

This is Houston. We are inquiring if it is your plan to. Over.

03 05 35 00 CDF

It never was our plan to; but it's in the flight plan, so I guess we'll do it.

03 05 35 07 CC

Houston. Roger. Out.

03 05 35 47 CC

11, Houston.

03 05 35 53 CMP

Roger. Go ahead.

03 05 35 54 CC

For use in connection with the prime meridian crossing, you have an orbital period now of 2 hours 8 minutes and 37 seconds. Over.

03 05 36 10 CMP

Thank you.

03 05 36 11 CC

Roger. Out.

03 05 38 16 CC

Apollo 11, this is Houston. A little over 2 minutes to LOS. All your systems parameters and orbit are looking good from the ground. We have AOS on the other side at 78 23 31. Over.

03 05 38 40 CDR

Roger. 78 23 21.

03 05 38 43 CC

Roger. That was 31 on the end.

03 05 38 50 CMP

Okay.

03 06 03 -- BEGIN LUNAR REV 2

03 06 23 55 CC

Apollo 11, this is Houston. Over.

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03 06 24 09 LMP

This is Apollo 11. Are you picking up our signals okay?

03 06 24 13 CC

Apollo 11, this is Houston. Affirmative. We are reading you loud and clear on voice and we have a good clear TV picture, a little bright crater in the --

03 06 24 23 LMP

-- No, no, no --

03 06 24 24 CC

-- the bottom of the picture. I guess that's the spot on the tube.

03 06 24 30 LMP

I'm sorry about that one.

03 06 24 33 CC

And if you give us P00 and ACCEPT, we will uplink our new state vector and target load to you.

03 06 24 45 CMP

Okay.

03 06 25 30 LMP

Houston, Apollo 11. One of the larger craters on the back side - I noticed a small, dark speck on the outer wall and I put the monocular on it. I was able to see - oh, an area maybe a quarter of a mile in diameter. It was really a freshlooking dark colored pit, and that seems to be in contrast with all the other fresh little craters or holes that you can perceive on the walls of any of these craters. Around this particular one there seems to be two or three of these - especially the one that caught my attention. Quite remarkable. Over.

03 06 26 24 CC

Roger. Do you have a location on that one?

03 06 26 34 LMP

No, not a precise one. I've got several pictures of it, though.

03 06 26 38 CC

Roger. We copy.

03 06 26 47 CC

We're getting a beautiful picture in down there now, 11. The color's coming in quite clearly, and we can see the horizon and the relative blackness of space, and without getting into the question of grays and browns, it looks, at least on our monitor, sort of a brownish gray.

03 06 27 10 LMP

That's a good, reasonable way of describing it. It appears to me as though it made a difference just sitting back in the tunnel and gazing at all windows; it makes a difference which one you're looking out of. For example, the camera

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right now is looking out the number 5 window, and it definitely gives a rosier or tanner tinge, especially when you look straight through it and not at an angle. Over.

03 06 27 45 CC

Roger.

03 06 27 53 LMP

And if you rear back 95 or 100 degrees ...

03 06 27 54 MS

... Still holding ... Okay.

03 06 28 02 CC

Say again, 11?

03 06 28 07 LMP

I'd say we're about 95 degrees east, coming up on Smyth's Sea.

03 06 28 11 CC

Roger. And for your information, we show you at an altitude of about 92 miles above the surface right now.

03 06 28 21 LMP

Okay.

03 06 28 22 CMP

Houston, Apollo 11. Could you observe a difference in the N2 pressures before LOI? It seems to me as though the two were not equal on the ... B tank was a little low on pressure. Over.

03 06 28 57 CMP

I'm flying it in SPS minimum impulse, Houston, and it's rather difficult to keep it on a constant data. The LM wants to wander up and down. I'm not sure if it's in response to MASCONN's or what, but I can get it completely stabilized in DATA and let it alone, and in another couple of minutes it will have developed its own rate.

03 06 29 22 CC

This is Houston. Roger.

03 06 29 30 CMP

Houston, we'll be moving shortly from the side window to the hatch window, and we'll try and pick up some of the landmarks that we'll be looking at as we approach the powered descent. Over.

03 06 29 47 CC

11, this is Houston. Roger. And we're through with the uplinks; the computer is yours. You can go to BLOCK and we'll have the information on nitrogen for you shortly. Over.

03 06 30 01 CMP

Roger. Copy.

03 06 30 08 LMP

Okay, Houston. Several minutes ago I was exactly steady on data, and since then I have been moving

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toward the LM, pointed straight down toward the radius vector, and that's been despite a number of down minimum pitch impulses.

03 06 30 30 CC

Roger.

03 06 30 49 LMP

We're over Smyth's Sea right now.

03 06 30 51 CC

Roger.

END OF TAPE

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03 06 30 56 CMP

We're about 88 degrees east, I would estimate.

03 06 31 04 CC

We show you about south of the - southwest of the crater Jansky right now.

03 06 31 28 CMP

Smyth Sea doesn't look much like a sea. It - The area which is devoid of craters, of which there's not very much, is sort of a hilly looking area. It's not like the maria at all.

03 06 31 41 CC

Roger. We copy that about the sea, and it looks like you were just giving us a view of the crater Neper, the large crater on the left, and Jansky on the right.

03 06 32 06 CMP

We think you're close, but no cigar.

03 06 33 20 CC

11, this is Houston. Would you care to comment on some of these craters as we go by?

03 06 33 29 CDR

Roger. We're approaching the approach path to ignition. This is equivalent to 13 minutes before ignition, and we're at about 83 degrees, I guess - 83 degrees east. That correspond to location you're holding there presently?

03 06 33 59 CC

Roger. We're showing your present position as about 77 - 76 degrees east looking back towards the east.

03 06 34 16 CMP

Hey, you should be looking back at Smyth Sea now.

03 06 34 19 CC

Roger.

03 06 34 23 CDR

Okay.

03 06 34 25 CMP

Houston, what you're seeing in the middle of the screen now is the crater Schubert and Gilbert U is in the center right now; and this comes up at about - a little over 12 minutes before power decent. Instead of me looking - Instead of looking back at it, we'd be looking straight down at it in descent.

03 06 34 50 CC

Roger.

03 06 34 55 CC

And we show you at an altitude now of about 110 miles; and, of course, you'll be considerably lower at the initiation of powered descent.

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03 06 35 18 CMP

Okay, Houston. Look at register 3 on the DSKY data. This data is increasing toward my desired of 315; and I'll let the hand controller alone here, and I'll bet you it reverses itself.

03 06 35 46 CC

Roger, 11. We're watching the DSKY now, and it's still coming in beautifully on the TV.

03 06 35 59 LMP

Okay. There's - on the right side of the screen at the present time, there's a triple crater with - with a small crater between the first and second; and the one at the bottom of the screen is Schubert Y. Zoom in; it does have a central peak in Schubert Y. Actually, several of them, and you can observe those plus the rim craters at the bottom of your screen.

03 06 36 36 CC

Roger. We're seeing the central peak quite clearly now.

03 06 36 53 LMP

Okay. We're zooming in now on a crater called Schubert N. Schubert N, very conical inside walls and the bottom appears to be nearly flat.

03 06 37 11 CMP

Look at data on the DSKY. It's stabilized and is holding steady now.

03 06 37 19 CC

Roger.

03 06 37 20 LMP

Looking out the window I can see a number of small craters on the bottom of Schubert N.

03 06 37 32 CMP

We're coming up on the Foaming Sea where I'll be doing some P22 marking on a crater of my choice, name of crater, Camp.

03 06 37 41 CC

Okay. We'll be watching for Neper.

03 06 37 49 CMP

And notice register 3 has reversed itself, and it's heading back the other way now without any pitch thruster firing.

03 06 37 56 CC

Roger, Mike. We confirm that you've changed the direction of your pitch rate.

03 06 38 28 CMP

Generally speaking - -

03 06 38 30 LMP

The crater - -

03 06 38 31 CMP

- - The tendency seems to be to pull the LM down toward the center of the Moon there as in a gravity gradient experiment.

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03 06 38 40 CC

Roger, 11. We copy - -

03 06 38 43 CMP

It may have something to do with MASSCON's or it may - -

03 06 38 46 CC

Roger. We copy ...

03 06 38 47 LMP

...

03 06 38 48 CMP

It may have something to do with MASSCON's or it may just be the peculiarity of the DSKY display.

03 06 38 51 CC

Okay. We've observed the behavior of your DSKY, and I think we've got the data here to work on it. Let us grind around a little while on it, and we'll report back to you, probably in a REV or two.

03 06 39 08 CMP

Okay. Well, in the meantime, I'm going to pitch down toward 315.

03 06 39 14 CC

Roger.

03 06 39 25 LMP

Three craters - three horizontal craters that you now have in the field of view are immediately underneath the ground track. The right hand is the largest crater that you see, Dubiago P.

03 06 39 49 CC

Roger. We concur on the identification of that crater.

03 06 40 01 CC

And we show you coming up on landmark Alfa 1 here shortly.

03 06 40 11 LMP

Roger. Mike's having his first look at Alfa 1 at the present time.

03 06 40 22 CMP

Yea. It's a very bright crater. It's not a large one but an extremely bright one. It looks like a very recent and, I would guess, impact crater with rays streaming out in all directions which should make my - Correction - the Foaming Sea easy to see coming up on it now. Crater Camp is one of the smaller ones out on the - on the floor of the Foaming Sea.

03 06 41 34 CC

Here we show you over the Sea of Fertility now, and we ought to have Langrenus down south of track a few degrees, about 9 degrees south of track.

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03 06 41 48 LMP

Now the crater that's in the center of the screen now is Webb. We'd be looking straight down on it at about 6 minutes before power descent. It has a relatively flat bottom to the crater, and you can see maybe two or three craters that are in the bottom of it on the western wall, the wall that's now nearest the - the camera. Near the bottom of the screen, we can see a dimple crater, just on the outside. And then coming back toward the bottom of the screen and to the left, you can see a series of depressions. It's this type of connected craters that give us most interest to discover why they're in the particular pattern that they're in. I'll zoom the camera in now and try and give you a closer look at it.

03 06 42 48 CC

Roger. We're observing the dimple crater now. The central peak we can see on the Orbiter photos doesn't seem to stand out very well here.

03 06 43 02 LMP

Well, they're not central peaks. They're depressions in the center.

03 06 43 05 CC

Roger.

03 06 43 08 CMP

And you'll notice on the pitch thruster activity, I've still - I've put in a dozen minimum impulses in pitchdown, and I'm still far from correcting back to 315.

03 06 43 20 LMP

We're moving the camera over to the right window now to give you Langrenus, its - its several central peaks and -

03 06 43 29 CC

Roger. We got Langrenus in our screen now.

03 06 43 54 CC

Okay, 11. This is Houston. We're getting a beautiful picture of Langrenus now with its rather conspicuous central peak.

03 06 44 07 CMP

The Sea of Fertility doesn't look very fertile to me. I don't know who named it.

03 06 44 12 CDR

Well, it may have been named by a gentleman whom this crater was named after, Langrenus. Langrenus was a cartographer to the King of Spain and made one of the - one of the early reasonably accurate maps of the Moon.

03 06 44 39 CC

Roger. That's very interesting - -

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03 06 44 41 CDR

... at least it sounds better for our purposes than the Sea of Crises.

03 06 44 46 CC

Amen to that.

03 06 44 52 CC

Okay. It looks like you're coming inside now on the camera.

03 06 44 59 LMP

Well, I can't get behind to see the monitor. I'll bring the focus in, but we're going to be looking down past one of the LM quads and one of the antennas almost straight down at the ground track that we'll be seeing coming in now. I guess there's maybe 2 or 3 minutes before power descent.

03 06 45 37 LMP

All right, that should put the LM structure about in focus, and I'm going to move it out to infinity and then expand the field of view.

03 06 46 00 LMP

Crater Secchi is out my window now, window number 2.

03 06 46 09 CC

Hello, Apollo 11. This is Houston. We show you coming up on the terminator at 78 53, about 7 minutes from now, and we've also got the LOI 2 and TEI 5 PAD's ready for you after the TV whenever you want to terminate. Over.

05 06 46 31 LMP

Roger.

03 06 46 33 CC

And we're getting a good view of the track leading into the landing site now and -

03 06 46 58 CC

Okay, And it looks like we got Secchi K, went by about 10 seconds ago; coming up on Apollo Ridge.

03 06 47 36 CC

And in the right hand portion of our screen right now, we can see Messier Alfa and Bravo with the light colored rays streaming off in one direction.

03 06 48 00 LMP

I don't know if you can make out, but in the Sea of Fertility there are a number of craters that are just barely discernible, old, old craters whose outlines are just barely able to be seen.

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03 06 48 14 CC

Roger. I think we can make them out. The color really enhances our ability to discern features and craters over what we see in real time on our black and white monitor.

03 06 48 31 LMP

Right. The - At these low Sun angles, there's no trace of brown, it's now returned to a very gray appearance and, like the 8 crew says, it has a look of plaster of paris to it at this Sun angle, which is completely lacking in ...

03 06 48 49 CC

Roger.

03 06 49 06 LMP

Okay. This is very close to ignition point for power descent. Just passing Mount Marilyn that - that triangular shaped mountain that you see in the center of the screen at the present time with crater Secchi Theta on top of the far northern edge of the mountain.

03 06 49 32 CC

Roger. We're getting a good view of Mount Marilyn and the Secchi Theta.

03 06 49 45 LMP

And now we're looking at what we call Boot Hill; occurs 20 seconds into the descent.

03 06 50 08 LMP

The bright, sharp rimmed crater at the very right edge of the screen, Censorinus T. Now passing the - the 1 minute point in power descent.

03 06 50 30 CC

Roger. And for your information, your current altitude is 148 nautical miles above the surface.

03 06 50 39 LMP

Don't you think?

03 06 50 43 CMP

I'm unable to determine altitude at all looking out the window. I couldn't tell whether we were down at 60 or up at 170.

03 06 50 50 CC

I bet you could tell if you were down at 50,000 feet.

03 06 50 57 CMP

I wouldn't be surprised.

03 06 51 11 LMP

We're passing some steep ridges here. The edge of some old craters that were photographed by Apollo 10; and those - the crew of Apollo 10 was very impressed with the steepness of these ridges when they came over them at about 50,000 feet.

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03 06 51 36 CC

Roger. We can observe they're also steep even from this altitude. You got quite a shadow being cast by the Sun at these low angles.

03 06 51 47 LMP

The entire surface is getting considerably darker than the surface that we looked at previously when the Sun was quite high above us. The crater in the - bright crater in the center of the screen, - well, the smaller one is Censorinus.

03 06 52 09 CC

Roger. And we show you low over 1 minute from the terminator at the present time.

03 06 52 24 LMP

How's the brightness of the picture you're receiving? You think we ought to open f stop some as we approach the terminator?

03 06 52 34 CC

Yes. The brightness is still doing quite well. You can go ahead and open it up a stop or two. The automatic light level compensation seems to be working beautifully.

03 06 52 58 LMP

There's a good picture of Boot Hill.

03 06 53 02 CC

Roger. We're - -

03 06 53 03 LMP

Three minutes and 15 seconds into the descent.

03 06 53 08 CC

Roger. We're seeing Boot Hill now.

03 06 53 10 LMP

The next crater coming into the bottom, that's Duke Island right there, and to the left, the crater - the largest of the craters near the center of the picture right now is Maskelyne W. This is a position check during descent at about 3 minutes and 39 seconds, and it's our down range position check and cross range position check prior to yawing over face up to acquire the landing radar. Past this point, we would be unable to see the surface below us until getting very near the landing area.

03 06 53 57 CC

Roger. I imagine you'll get a - you'll get a real good look at that tomorrow afternoon.

03 06 54 14 LMP

Sinuuous Rille is the one that was referred to in Apollo 10 as Sidewinder.

03 06 54 21 CMP

That's a good name, too: Sidewinder and Diamondback. It looks like a couple of snakes down there in a lake bed.

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03 06 54 42 LMP

And we're approaching the terminator now. See the - -

03 06 54 48 CC

Roger.

03 06 54 49 LMP

Contrast has increased and only the sunlit side of these ridges remain illuminated, while the dark sides and the shadow will become completely black.

03 06 54 59 CC

11, this is Houston. The picture's getting a little grainy now. You might go ahead and open up the f stop.

03 06 55 19 LMP

Landing point is just barely in the darkness. That one crater, the upper part of which you see, lower part completely in darkness. The small, well defined crater is Moltke, which is about abeam of the landing sight.

03 06 55 32 CC

Roger. We can just see; it looks like a little less than half of its rim right now.

03 06 55 45 CC

And we can make out just barely some features on the surface, maybe from earthshine.

03 06 55 58 CC

Are you wide open on the f stop at this time?

03 06 56 03 CMP

Yes, we are.

03 06 56 06 LMP

Yes. And it looks like we're just about to get the Sun coming into the lens, so we'll have to move the camera away.

03 06 56 12 CC

Roger.

03 06 56 14 CMP

We can't see any earthshine or any surface features at all in earthshine now due to the fact that the LM is very bright and is causing our pupils to contract. It's a very fantastic view to see the terminator as you look along the edge of it. I think you'll agree that some of these craters that you're seeing in the picture now are really accentuated by the lengthening of the shadows as they come close to the terminator.

03 06 56 42 CC

Yes. It's a very beautiful and a rugged sight that we've got on the screen now.

03 06 56 52 CMP

And I think you've got some interesting data on thruster firing versus pitch angle. It looks

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like that LM just wants to head down towards the surface, is all.

03 06 57 01 CC

Roger. I have a comment here that says that's what the LM was built for.

03 06 57 12 CMP

I believe!

03 06 57 45 CMP

And as the Moon sinks slowly in the west, Apollo 11 bids good day to you.

03 06 57 50 CC

Roger. We sort of thought it was the Sun setting in the east.

03 06 58 00 CMP

Well, it depends on your point of view.

03 06 58 04 CC

Roger. Out.

03 06 58 20 CC

Apollo 11, Houston. When you're ready to copy, I have an LOI 2 PAD and a TEI 5 PAD. Over.

03 06 58 30 CMP

Okay. Stand by.

03 06 58 46 CMP

I'm passing 182 inertial. I'm going inertial now.

03 06 58 54 LMP
Ready to copy LOI 2 PAD.

03 06 58 58 CC
Roger on the inertial. And here we go on the LOI 2 PAD. LOI 2, SPS/G&N: 38320, plus 166, minus 081; TIG 080 11 3603. NOUN 81: minus 01408, minus all balls, minus 00743. Roll all balls, 196 359 00657, plus 00537. DELTA-VT 01592 017 01531. Sextant star 23 1160 138. The rest of the PAD is NA. GDC align, Vega and Deneb 243 183 012. Ullage, two jets 19 seconds. Remarks: On your DAP load, we would like an R1 20101 vice the value which appears in the flight plan. In making the sextant star check this must be done between GET of 79 30 10, at which time the star comes above the horizon, and 79 52 10, which is your local sunrise due to the fact that this star's relatively close to the Sun. Your burn orientation is heads down, retrograde pitched up 28 degrees with respect to local horizontal. The calculated values for NOUN 42 are HA 65.6 and HP 54.6. Both of those being plus. Read back. Over.

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03 07 01 55 LMP
Roger, LOI 2: SPS/G&N: 38320, plus 166, minus 081 080 11 3603, minus 01408, minus all balls, minus 00743, all zeros, 196 359 00657, plus 00537, 01592 017 01531 23 1160 138. Vega, Deneb 243 183 012, two jet 19 seconds, DAP, R1 20101. Sextant star between 79 30 10 and 79 52 10. Attitude is heads down, retrograde pitched up 28 degrees. HA after the burn - Was that NOUN 42 for HA and 64.6 and HP 54.6? Over.

03 07 03 19 CC
Roger. On the NOUN 42 value, the last stuff you gave, HA is 65.6, HP is 54.6. Otherwise, I readback correct. I'm standing by with your TEI 5 PAD. Over.

03 07 03 37 LMP
Roger. HA 65.6 for NOUN 42. And ready to copy.

03 07 03 44 CC
11, this is Houston. TEI 5 SPS/G&N: 37201, minus 060, plus 047; TIG 086 09 3666. NOUN 81: plus 33521, plus 03441, minus 01458; roll NA, pitch 032. The rest of the PAD is NA. Ullage two jet, 16 seconds undocked. Over.

03 07 04 44 LMP
Roger. TEI 5 SPS/G&N: 37201, minus 060, plus 047 086 09 3666, plus 33521, plus 03441, minus 0145 458, NA, 032. The rest is NA. Two jet, 16 seconds, undocked. Over.

03 07 05 16 CC
Apollo 11, this is Houston. Readback is correct. Out.

03 07 05 42 CC
Apollo 11, this is Houston.

03 07 05 44 CMP
Houston, you want us back on downvoice backup? Over.

03 07 05 49 CC
Apollo 11, this is Houston. That's affirmative on the downvoice backup. We'd like you to confirm your UPTELEMETRY switch in the NORMAL position. Over.

03 07 06 04 CMP
Roger. It's in BLOCK. Did you get us the - You got us a new CSM state vector and an LOI 2 target load in between all that television, didn't you?

03 07 06 13 CC
That's affirmative.

03 07 06 17 CMP
Thank you.

03 07 06 18 CC

And what I'm asking for is the switchover to - -

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03 07 06 20 CMP

The UPTelemetry switch is in NORMAL. Over.

03 07 06 22 CC

Roger. Out.

03 07 21 51 CC

Apollo 11, this is Houston. Over.

03 07 21 57 LMP

Go ahead, Houston.

03 07 21 58 CC

Roger. During the LOI 1 burn, your engine burned a little bit more propellant than we predicted, and consequently, we'd like to update - or send you a new TEI 4 PAD. Over.

03 07 22 19 LMP

Okay.

03 07 22 23 CMP

Our chamber pressure onboard was higher that time, too. It's all on the onboard tape, the time entry, and the chamber pressure; but to make a long story short, it worked its way up to 100.

03 07 22 34 CC

Roger.

03 07 22 39 CC

And down here, we showed a chamber pressure of on the order of 103 to 104 psi during your burn on playback.

03 07 22 50 CMP

Okay.

03 07 22 52 LMP

Go ahead with the TEI 4.

03 07 22 54 CC

Roger. TEI 4 revised: SPS/G&N: 38320, minus 055, plus 060 084 30 2749, plus 31380, plus 03475, minus 01032; roll NA, pitch 034. Rest of the PAD is NA. Ullage two jets 16 seconds, undocked. No LOI 2. Over.

03 07 23 52 LMP

Just in TEI 4 SPS/G&N: 38320, minus 055, plus 060 084 30 2749, plus 31380, plus 03475, minus 01032, NA, 034. All the rest of the PAD's NA. Two jets, 16 seconds, undocked. No LOI 2.

03 07 24 29 CC

11, this is Houston. Readback correct. Out.

03 07 32 19 CC

Apollo 11, this is Houston.

03 07 32 24 LMP

Roger. Go ahead, Houston.

03 07 32 26 CC

Roger. We've been looking at your systems data on playback, and everything is looking good. In particular, the SPS looks good. I would like to

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remind you, though, of a request to perform this burn on the bank A ball valves only, and you are GO for LOI 2. Also, we have currently in the flight plan, you scheduled tomorrow to start entering the LM at about 96 hours GET, and we'd like to know if you have any plans to initiate this ingress into the LM earlier. If so, we can call the people in ahead of time. Over.

03 07 33 15 LMP

Well, we didn't have any plans to. No. We just wanted to be ready at that time.

03 07 33 20 CC

Roger. We just wanted to make sure that we were ready when you were ready. Over.

03 07 33 27 LMP

Okay. And to get the sextant star in LOI 2, that's roll zero. Is that affirmative?

03 07 33 38 CC

That's affirmative. Roll zero.

03 07 33 43 LMP

Okay.

03 07 43 30 CC

Apollo 11, Houston. Five minutes until LOS. And with respect to your request for the nitrogen bottle pressures preburn, just before the burn, we were showing 2270 pounds per square inch on bottle Alfa and 2350 on bottle Bravo. Over.

03 07 43 58 CMP

Apollo 11. Roger. Thank you.

03 07 44 00 CC

Roger. Out.

03 07 46 23 CC

Apollo 11, this is Houston. Two minutes to LOS. Your AOS on the other side is 80 33 21, and the friendly White Team will see you when you come out from behind the Moon.

03 07 46 41 CMP

Apollo 11. Roger.

03 07 46 43 LMP

Thank you, Bruce.

03 07 46 44 CC

Make that your friendly "Greens". Your friendly White Team CAP COMM will see you when you come out from behind the Moon. I think it's basically the Maroon Team here, and we "Greenies" are leaving.

03 07 46 56 CMP

Okay. I don't blame you, Hank.

03 07 47 06 CC

Roger. I'd rather be up there.

END OF TAPE

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03 08 12 -- BEGIN LUNAR REV 3

03 08 35 30 CC

Hello, Apollo 11. Houston. We're standing by. Over.

03 08 35 58 CDR

VGY minus 0.0, VGZ minus 0.1, DELTA-VC minus 5.2, fuel 362, OX 364, unbalance plus 50, and our postburn now 94's, 66.1 by 54.4. Go ahead.

03 08 36 25 CC

Roger. We copy, Neil. Would you say again the DELTA-VZ? We missed that. Over.

03 08 36 32 CDR

Roger. That was minus 0.1.

03 08 36 35 CC

Roger. Copy the burn report. Sounds good.

03 08 36 43 CDR

And all looked good up here.

03 08 37 07 CC

Apollo 11, Houston. We missed your DELTA-TIG and also your DELTA burn time. Over.

03 08 37 15 CDR

DELTA-TIG was zero and the burn time was 17 seconds.

03 08 37 20 CC

Copy 17.

03 08 38 05 CC

Apollo 11, Houston. We'll be satisfied if you pump up the cabin to 5.4. Over.

03 08 38 14 CDR

Okay. We're showing about 5.2 right now.

03 08 38 18 CC

Roger.

03 08 38 40 CDR

And, Charlie, the LM/CM DELTA-P is just over 1 pound right now.

03 08 38 44 CC

Copy. Out.

03 08 43 48 CC

Apollo 11, Houston. Over.

03 08 44 32 CC

Hello, Apollo 11. Houston. Over.

03 08 45 28 CC

Apollo 11, Houston. If you read, please attempt to acquire on the high gain. We're having trouble locking up on the TM and we have no voice. Over.

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03 08 47 23 CC

Hello, Apollo 11, Apollo 11.

03 08 47 24 CDR

Roger.

03 08 47 26 CC

Roger. We're reading you five by. Go ahead. Over.

03 08 47 27 CDR

Roger. We have you on high gain now.

03 08 47 34 CC

Roger. We lost the TM and the voice for about 5 minutes here. We attempted a handover and fouled it up in some manner, but we got you back now. Thank you much.

03 08 47 47 CDR

Okay. We're pressurizing the LM at this time.

03 08 47 50 CC

Copy.

03 08 50 51 CC

Hello, Apollo 11. Houston. We have a P22 AUTO optics update for you if you're ready to copy. Over.

03 08 51 22 CMP

Ready to copy.

03 08 51 23 CC

Roger, Mike. It's landmark Alfa 1: T1, 82 37 35; T2, 82 42 50. We're 7 miles north. Over.

03 08 51 59 CMP

Copy. P22: T1, time 82 37 35; T2, 82 42 50. And the target is 7 miles north. Thank you.

03 08 52 21 CC

Roger.

03 08 55 32 CDR

I get the distinct impression, Charlie, that there laps up over the edge of the mountains at the shorelines.

03 08 55 42 CC

Roger. We copy.

03 08 56 40 CC

Houston. On your comment about the mare lapping up to the terrain - mountainous terrain, is that an impression like a lava flow coming in around a prominence, Neil, or is it more -looks like it's sloping up at that point? Over.

03 08 57 06 CDR

It isn't true everywhere, but there's certainly places where there seems to be a slope downward towards the shoreline on the mare. In other words, from the mare down to the shoreline is a downward slope indicating that it might be a lava flow.

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03 08 57 23 CC

Roger.

03 08 58 41 CDR

Crossing Duke Island and Maskelyne W.

03 08 58 47 CC

Say again, Neil. Over.

03 08 58 50 CDR

We just crossed Duke Island and Maskelyne W.

03 08 58 52 CC

Roger.

03 09 22 57 CC

Hello, Apollo 11. Houston. We're wondering if you've started into the LM yet. Over.

03 09 23 06 CDR

We have the CSM hatch out, the drogue and probe removed and stowed, and we're just about ready to open the LM hatch now.

03 09 23 16 CC

Roger. Thank you much, Neil. We'll be standing by.

03 09 25 53 CDR

Okay, Charlie. We're in the LM. The docking index mark is the same.

03 09 26 00 CC

Roger. We copy.

03 09 26 53 LMP

Charlie, apparently there just doesn't seem to be any slow way to get that REPRESS to AUTO without making a big bang.

03 09 27 01 CC

Apollo 11, Houston. Say again. Over.

03 09 27 08 LMP

Roger. There just doesn't seem to be any slow way to get the REPRESS closed to AUTO and avoid a big bang. Over.

03 09 27 16 CC

We copy, Buzz. Thank you much. Out.

03 09 27 23 CC

We concur with that, Buzz.

03 09 27 35 CC

Apollo 11, Houston. We'll have LOS 81 45, next AOS - Stand by.

03 09 27 47 CC

Next AOS 82 32. Over.

03 09 27 55 CDR

Okay. 82 32.

03 09 29 30 CMP

Houston, Apollo 11. I am going to start a maneuver to P22 attitude at this time.

03 09 29 35 CC

11. Roger. We copy. Over.

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03 09 29 41 CMP

Okay. We're noticing some water inside the command module for the first time. There's a little puddle of it on the aft bulkhead sort of like 101 had.

03 09 29 49 CC

Roger.

03 09 29 54 CMP

I'd like to know how EECOMM wants to get rid of it. There are a number of different ways and what does he think is the best one?

03 09 30 00 CC

We'll be with you in a moment, Mike. Stand by.

03 09 30 05 CMP

No big rush. It will wait until the next REV or two.

03 09 30 08 CC

All right.

END OF TAPE

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03 09 41 21 CC

Hello, Apollo 11. Houston. We've played back the LOI 2 burn. It looks really good to us. The systems were all good. We got an orbit on the limited amount of tracking at 65.4 by a 53.9. Over.

03 09 41 40 CDR

Sounds good, Houston.

03 10 10 -- BEGIN LUNAR REV 4

03 10 32 35 CC

Hello, Apollo 11. Houston. We're standing by. Out.

03 10 32 43 CMP

Okay, Houston. We'll be done with P22 in just a couple of minutes.

03 10 32 46 CC

Roger. We copy all that. You're looking good.

03 10 47 01 CMP

Houston, Apollo 11.

03 10 47 03 CC

Go ahead.

03 10 47 07 CMP

Roger. You copy that NOUN 49 on your downlink? If you've had enough time, I'll proceed.

03 10 47 11 CC

We got it. Go ahead, Mike.

03 10 50 27 CC

Apollo 11, Houston. We see a NOUN 89. You can do the VERB 34 now. Over. Beat me to it.

03 10 50 35 CMP

Yes. I've done it, Charlie.

03 10 50 37 CC

Roger.

03 10 52 19 CMP

Houston, Apollo 11.

03 10 52 22 CC

Go ahead, 11. Over.

03 10 52 26 CMP

All that procedure for P22 seemed to work very well. The only thing that was a little odd, is that there was some DAP thruster activity. I had pitch in ACCEL COMMAND, and roll and yaw in RATE COMMAND, and somehow, roll and yaw got excited and the DAP went into a flurry of thruster firing. We've noticed the same thing in the CMS, and just written it off as a CMS peculiarity.

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03 10 52 55 CC

Roger. We saw that activity, Mike. We'll see if we can track it down and let you know. Over.

03 10 53 03 CMP

Okay.

03 10 53 46 CC

Apollo 11, Houston. You can proceed to sleep attitude now. Over.

03 10 53 54 CMP

That's in work, Houston.

03 10 53 56 CC

Okay.

03 10 54 23 CMP

Houston, we're holding inertial a little while to study the approach to the landing zone.

03 10 54 27 CC

Roger.

03 10 56 50 LMP

Houston, this is Apollo ... in the Eagle - Apollo 11 in the Eagle. I've got ... for our landing area.

03 10 57 01 CC

Apollo 11, Houston. You are breaking up badly. Say again. Over.

03 10 57 09 LMP

Roger. I can see the entire landing area from the position I'm in looking out the left window in the LM.

03 10 57 20 CC

Roger, Buzz. Understand you can see the entire landing area looking out the LM windows. Over.

03 10 57 28 LMP

That's right.

03 10 59 07 SC

...

03 10 59 12 CC

Apollo 11, Houston. Say again. Over.

03 10 59 56 CC

Apollo 11, Houston. We got a lot of noise on the downlink. Would you please try your high gain in wide beamwidth, and the angles are 180 the yaw and pitch zero. Over.

03 11 00 30 CMP

Houston, Apollo 11. How do you read us on the high gain? Over.

03 11 00 34 CC

Roger, Mike. You're a lot better now. Over.

03 11 00 38 CMP

Okay. You want a wide beam for some reason?

03 11 00 43 CC

That's affirmative. We got you in the shadows, though. You are looking right down along the engine bell towards the Earth so we need you in wide beam. Over.

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03 11 00 53 CMP

Okay. Fine. We're starting our maneuvers to sleep attitude. Roll 82, pitch 229, yaw zero.

03 11 01 02 CC

Roger. The angles you got in the flight plan will be good when you get there.

03 11 03 43 CDR

Houston, 11.

03 11 03 45 CC

Go ahead, 11. Over.

03 11 03 49 CDR

Okay. We are on page activation 12 and 13, step 4, and verify descent talkbacks gray, and they're barberpole.

03 11 04 04 CC

Roger. Stand by.

03 11 04 13 CC

Apollo 11, Houston. We would like you to take the low voltage taps OFF; RESET, then ON. Over.

03 11 04 22 CDR

Stand by. We got it. We just had one circuit breaker out of position.

03 11 04 26 CC

Okay.

03 11 04 28 CDR

We have them gray now.

03 11 04 29 CC

Roger.

03 11 09 14 LMP

... should have warmed up by now.

03 11 09 53 LMP

Oh, he's transmitting on B.

03 11 09 54 CDR

Hey, Mike, you transmitting on B?

03 11 10 22 LMP

Houston, Apollo 11 - Apollo 11/Eagle. Over.

03 11 10 29 CC

Roger, Eagle. This is Houston. We read you. Over.

03 11 10 35 LMP

Roger. I read you about four by four. Could you give me a short count, please?

03 11 10 40 CC

Roger, Eagle. Coming in with the short count - 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Houston out. Over.

03 11 10 55 LMP

Roger. Are you copying my low bit rate? Over.

03 11 10 58 CC

Roger. We got some beautiful data here, Eagle. We're - All those guys are looking at it - systems guys. We'll have some word for you in a minute how everything looks.

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03 11 11 09 LMP

Roger. I'm all ready to switch to high bit rate if that's okay with you.

03 11 11 13 CC

Would you please stand by, Eagle. We want to get to the proper sleep attitude before we proceed on with the COMM check. Over.

03 11 11 23 LMP

Standing by.

03 11 11 33 LMP

Houston, Eagle. We'll go ahead with the camera checkout. I'm still on low taps, and I assume there's no problem doing that. Over.

03 11 11 42 CC

Stand by.

03 11 11 46 CC

That's affirmative. No problem on that, Eagle. You can go ahead and power up the sequence camera. Over.

03 11 12 00 LMP

Should have done that before.

03 11 12 03 CC

Eagle, be advised - sounds like a hot mike. Over.

03 11 12 04 LMP

Right. Yes.

03 11 12 16 LMP

Roger. If you're reading me now, I am in hot mike because I'm in ICS push to talk, and DOWNVOICE BACKUP. Over.

03 11 12 24 CC

Roger. We just wanted to remind you. Over.

03 11 12 30 LMP

Thank you.

03 11 12 50 CC

Columbia, this is Houston. Are you maneuvering to sleep attitude? Over.

03 11 13 03 CC

Eagle, this is Houston. We have lost all the voice and data with Columbia. Would you see if he is maneuvering to sleep attitude? Over.

03 11 13 17 LMP

Hey, Mike. You maneuvering to sleep attitude?

03 11 13 20 CMP

...

03 11 13 24 LMP

I don't believe they can hear you, Mike. Are you maneuvering now to sleep attitude?

03 11 13 28 CMP

...

03 11 13 40 LMP

Houston, Eagle. The Columbia has maneuvered to sleep attitude. He's got the high gain antennas - antenna angles set in, and he should be communicating with you. Over.

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03 11 13 55 CC

Roger. We don't have him. Stand by.

03 11 14 02 CC

Eagle, Houston. Would you please have Columbia put in COMMAND RESET? Over.

03 11 14 12 CMP

Wilco. COMMAND RESET.

03 11 14 22 CC

Eagle, Houston. Since we're in sleep attitude, I'll give you another long count. If you're reading in this mode, we'd like you to switch to high bit rate. Over.

END OF TAPE

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03 11 14 38 LMP

Roger. Go ahead with your short count.

03 11 14 40 CC

Roger. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. We're reading you five by. You can go to high bit rate now. Over.

03 11 14 53 LMP

Roger. Going to high bit rate now.

03 11 15 34 CC

Eagle, this is Houston. Do you read? Over.

03 11 15 40 LMP

Houston, this is Eagle. Roger. Read you loud and clear. How me? Over.

03 11 15 45 CC

Roger. Reading you five by also, Buzz, and we got the high bit rate. It's looking beautiful through Goldstone. Giving you a count: 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Please give us a count. Over.

03 11 16 04 LMP

Roger, Houston. Eagle with a count. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Over.

03 11 16 15 CC

Roger. Stand by. We're reading you five by. Over.

03 11 16 23 LMP

Okay. I'm ready to go S band voice. Over.

03 11 16 27 CC

Stand by, Eagle. Stand by on step 4.

03 11 16 55 CC

Columbia, this is Houston. Would you please give us P00 in ACCEPT. We've got a load for you. Break. Eagle, we're ready to go to step 4. Please select S band voice to VOICE. Over.

03 11 17 53 CC

Hello, Eagle. This is Houston. How do you read - normal voice? Over.

03 11 18 00 LMP

Eagle - Houston, this is Eagle. Read you loud and clear on S band, normal voice. How me? Over.

03 11 18 05 CC

Roger. You're beautiful in this mode, Buzz. We're reading you five by. Coming with a short count and we'd like one back from you. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Houston out.

03 11 18 28 LMP

Roger. Houston, Eagle. You're gorgeous also. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Eagle, over.

03 11 18 39 CC

Roger, Eagle. This is better than the downvoice backup. Stand by 1

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03 11 18 55 CC

Eagle, Houston. Everybody's happy as a clam with this mode. We'd like to stay here for a little bit. Telemetry looks great, and the; voice is great. Over.

03 11 19 09 LMP

Roger. Understand. I'm checking out camera number 4 now.

03 11 19 26 CC

Eagle, Houston. Say again what you're checking out? Over.

03 11 19 35 LMP

Roger, Houston. Eagle has checked out both 70 millimeter cameras and both 16 millimeter cameras, and all work fine. Over.

03 11 19 46 CC

Sounds great. Stand by.

03 11 19 57 CC

Eagle, Houston. We've looked over your systems on the high bit rate. Everything looks super; we're ready to go. Over.

03 11 20 10 LMP

Roger. Stand by. You want to go back to low bit rate now?

03 11 20 13 CC

Stand by on that. Over.

03 11 20 28 CC

Eagle, Houston. We look good through the 210 on this mode. We're going to shift data select to an 85 foot dish to see what we've got, and then we'll be back to you on the 210. If you'll stand by a couple of minutes in this mode, we'll be back with you. Over.

03 11 20 48 LMP

Roger. Eagle standing by.

03 11 21 36 CC

Eagle, Houston. How do you read? Over.

03 11 21 52 LMP

Houston, Eagle. Read you loud and clear. Over.

03 11 21 55 CC

Roger. We're reading you five by. We've got the voice good through the 85; the telemetry is in and out through the 85. Stand by. We'll be back with you through the 210. Over.

03 11 22 28 CC

Eagle, Houston. You can go step 5 now. We'd like low bit rate. Over.

03 11 22 39 LMP

Houston, Eagle. You have low bit rate.

03 11 22 44 CC

Roger. Copy, Eagle.

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03 11 22 59 CC

Eagle, Houston. Could you give me a short count - this mode? Over.

03 11 23 07 LMP

Houston, this is Eagle with a short count. 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Eagle. Over.

03 11 23 15 CC

Roger, Eagle. You're five by. This S band voice is really beautiful. Over.

03 11 23 26 CC

And, Eagle, Houston. We'll be standing by in this mode for a minute or so. We'll be back with you if you'll just stand by. Over.

03 11 23 41 LMP

Roger.

03 11 25 26 CC

Eagle, this is Houston coming through the 210. How do you read? Over.

03 11 25 35 LMP

Roger. Read you loud and clear.

03 11 26 16 CC

Eagle, this is Houston. We're happy with all our data in all modes. You can power down the COMM now. Over.

03 11 26 26 LMP

Roger. I understand. Eagle will power down the COMM, and we are just approaching 27 volts now. It looks like we won't have to bother with the high taps.

03 11 26 39 CC

Right.

03 11 26 40 LMP

We're powering down. Out.

02 11 26 41 CC

Roger. Copy. Out.

03 11 26 44 CC

Columbia, this is Houston. We got a TEI 11 PAD for you and an update on the water dump. Over.

03 11 26 54 CMP

Stand by one, Houston. Are you through with the DSKY?

03 11 26 56 CC

That's affirmative. Over.

03 11 26 59 CMP

Okay.

03 11 29 25 CMP

Houston, Columbia. Ready to copy TEI 11. Over.

03 11 29 29 CC

Roger, Columbia. Here we come with the TEI 11. SPS G&N: 37200, minus 060, plus 047. NOUN 33, 098 05 2422, plus 41448, plus 03719, minus 02422. Roll is NA, pitch 020, the rest of the PAD is NA. Set stars are NA. The ullage is two quads -

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correction, two jets for 16 seconds; use Bravo and Delta. In the comments, the undocked present CSM - correction, this is for - TEI 11 is undocked. Present onboard weight of the CSM is 37200 pounds, about 50 Alfa on your DAP. Over.

03 11 31 17 CMP

All right. I read back: TEI 11, SPS G&N: 37200, minus 060, plus 047, plus 098, 05 2422, plus 41448, plus 03719, minus 02422; NA, 020; the rest of the PAD NA. Ullage, two jets for 16 seconds, Quads B and D. Undocked present CSM weight is okay in the DAP.

03 11 31 50 CC

Roger, 11. And we'd like you to do a waste water dump at 84 hours down to 25 percent. Over.

03 11 32 06 CMP

Roger. I understand. Waste water dump to 25 percent at 84 hours.

03 11 32 10 CC

Roger. And, Mike, we'll have LOS in about 11 minutes at 83 44. AOS is 84 30, and prior to - or at LOS, we would like you to go - Configure the S band for high gain track to REACQ, high gain beam to NARROW, and let's try that to see if we can get an automatic REACQ at the next AOS. Over.

03 11 32 43 CMP

Good idea.

03 11 32 51 CMP

I'm in REACQ and NARROW now.

03 11 32 54 CC

Roger.

03 11 33 31 CC

Apollo 11, Houston. Also, that water that you got on the aft bulkhead, we - If it's not too much, we just recommend sopping it up and then throwing the sponges away in the waste stowage area. If it's too much, then we recommend using the procedure in the checklist on page F10-14. Over.

03 11 33 58 CMP

All right. Thank you.

03 11 37 25 CC

Apollo 11, Houston. Would you have Buzz make sure he gives us the OPS pressure readings before you close up? Over.

03 11 37 35 CMP

Will do.

03 11 38 01 CDR

Houston, 11. The OPS read 5750, both bottles.

03 11 38 05 CC

Roger.

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03 12 08 -- BEGIN LUNAR REV 5

03 12 31 12 CC

Apollo 11, Houston. Over.

03 12 31 20 CMP

Houston, Apollo 11.

03 12 31 21 CC

11, Houston. Roger. Reading you fine, and it looks like the automatic REACQ went very well just as soon as you came around the limb. We have several small items to discuss with you here just before you go to sleep. Over.

03 12 31 29 CMP

Go ahead. Over.

03 12 31 40 CC

Okay, 11. First of all, on our LM systems checks, everything went fine. I would like to remind you, though, tomorrow you may see an ascent pressure light when you activate the MC&W. There should be no problem, however. You did note that the APS AUX tank pressure was only reading 111 psi, which is normal at this point, but below the level which will trigger your light due to the helium which has been dissolved into the propellant. Over.

03 12 32 18 CMP

Roger. Understand that. Thank you.

03 12 32 20 CC

Roger. And next item, the supercritical helium rise rate is nominal, and you also had that question for us about your thruster activity during the P22 on the last REV. Believe we understand that now, as you reported that your pitch was in ACCEL COMMAND and your yaw and roll were in RATE COMMAND. You were firing your pitch thrusters. This will couple rates into your yaw and roll axes, and the - You were at that time holding only half a degree deadband and coupling rates into yaw and roll produced the extra firings about the yaw and roll axes. Over.

03 12 33 07 CMP

Yes. That may be true. It's very peculiar coupling, in that it waits longer than you would think and its reaction is greater than you would think. We were getting yaw rates of around four tenths of a degree per second, for example.

03 12 33 23 CC

Roger, Mike. We did play the data back, and that's the way it looked upon analysis of the chart recordings back here. Over.

03 12 33 35 CMP

Okay. Fine.

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03 12 33 36 CC

They've also looked at the results of your landmark tracking. The marks all apparently were very good, and we've got a full page of data here relative to the altitudes of the various site locations, which I won't read up to you, but I did want to let you know that the marks apparently went very well. I also have your consumable budgets, particularly your RCS propellant quantities. They're Deltas from nominal if you should want them. Your worst quad is quad Charlie, which is 9 percent low. I'll not read up the others unless you want them. Over.

03 12 34 17 CMP

Okay. How about the O2 fuel cell purge? You want that now?

03 12 34 22 CC

I'll have to stand by just a moment.

03 12 34 26 LMP

Okay. And then the other one is, we're still charging battery A.

03 12 35 28 CC

11, Houston. We would like to delay the fuel cell purge until the backside of the Moon, and you go ahead and - should terminate your battery charge at this time. Over.

03 12 35 43 LMP

Okay. Understand. I knew we had another O2 and H2 purge coming up in the morning; I wasn't sure whether you wanted to go through with this one or not. I'll wait until the next side and then do it.

03 12 35 53 CC

That's fine, Buzz.

03 12 35 54 LMP

Terminate battery charging now.

03 12 35 56 CC

That's right, and one other systems item here - in order to balance your CRYO tanks, would you get your O2 tank 1 and your H2 tank 2 heaters off? Over.

03 12 36 16 CMP

Okay. I have O2 tank heater 1 off, and H2 tank heater 2 off.

03 12 36 25 CC

That's right, Mike, and we believe you have your quad Bravo and quad Charlie turned off in your DAP at this time, and a 5 degree deadband. We'd prefer a 10 degree deadband for your sleep period overnight here. Over.

03 12 36 43 CMP

Okay.

03 12 36 47 CC

One other item relative to a malfunction procedure. It's unlikely that you'll have to worry about this

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tomorrow, but in your malfunction list under docking on page F11 9, there is a malfunction procedure for a high O2 flow rate at the top of - under tunnel at the top of page 11 9. We would like to have you not use that malfunction procedure should you encounter the high O2 flow rate, and instead, check back with Houston for a revised procedure should you find that situation. Over.

03 12 37 38 CMP

Understand, and note has been made in my checklist.

03 12 37 45 CC

11, Houston. Roger. That just about takes care of all the items we have here on the ground before time to hit the sack, and I guess you will have a presleep check for us before you go to bed.

03 12 38 06 LMP

Roger. We're in the midst of cycling the O2 and H2 fans now.

03 12 38 11 CC

Roger.

03 12 38 21 LMP

And the radiation is as follows: CDR 11012, CMP 10013, LMP 09015. Negative medication. Over.

03 12 38 36 CC

Roger. Copy, 11.

03 12 41 54 LMP

Houston, Apollo 11.

03 12 41 56 CC

11, Houston. Go ahead.

03 12 42 01 LMP

Roger. We're thinking about taking the monocular with us on into the LM. We think it might prove to be of some use. Over.

03 12 42 10 CC

Roger, Buzz. It sounds like a good idea for some of your surveying work there inside the cockpit. Over.

03 12 42 21 LMP

Okay. You want to run that by with whoever might be concerned?

03 12 42 24 CC

I sure will.

03 12 47 47 CC

Apollo 11, Houston. We have apparently lost the high gain lock. We would appreciate it if you would give us a help manually to try to relock up on the high gain. Over.

03 12 48 07 LMP
Houston, Apollo 11. ..

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03 12 48 12 CC
11, Houston. Reading you very weak, still too far down in the noise to complete the full transmission. If you'd give us a hand on a manual relock, we'd appreciate it.

END OF TAPE

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03 12 52 02 CC

Apollo 11, Houston. We're still unable to pick you up on the high gain antenna. Request you go to MANUAL, and wide beam-width. The pitch and yaw angles in your checklist are good ones. You should be able to find us there. Over.

03 12 53 08 LMP

Houston, Apollo 11. How do you read now?

03 12 53 10 CC

11, Houston. Loud and clear this time. How me?

03 12 53 16 LMP

Loud and clear. You faded out on your last transmission. Over.

03 12 53 21 CC

Roger. Are you in wide beam now?

03 12 53 29 LMP

Negative. I got you locked back on again REACQ and narrow.

03 12 53 33 CC

Roger. That's all we want. We want to stay in narrow, and we're a little puzzled about why we lost you here a few minutes ago. Do you have any ideas?

03 12 53 48 LMP

No, we sure don't (cough) - sure don't. We're showing - we're showing about 15 degrees plus pitch and about 270. That ought to be good and clear.

03 12 54 00 CC

We concur there. We still don't have any good ideas on why we were lost then.

03 12 54 38 CC

11, Houston. Would you confirm that we did acquire automatically when you came around the limb for this passage. Over.

03 12 54 51 LMP

That's confirmed.

03 12 54 54 CC

Thank you.

03 13 04 38 CC

Apollo 11, Houston. Over.

03 13 04 44 LMP

Houston, Apollo 11.

03 13 04 46 CC

11, Houston. On your AUTO RCS SELECT switches, we show quad Bravo disabled but quad Charlie only partially disabled. Charlie 3, I believe, is the only one you have selected off. Is that correct?

03 13 05 05 CMP

Yes. Roger. That's correct.

Tape 55/2 Page 260

03 13 05 06 CC

Roger.

03 13 05 59 CMP

How do they look to you now, Houston?

03 13 06 06 CC

11, Houston. We see them all disabled at this time. Thank you.

03 13 06 15 CMP

Thank you.

03 13 09 22 CC

Apollo 11, Houston. Over.

03 13 09 30 LMP

Go ahead, Houston.

03 13 09 31 CC

11, Houston. We're going to try to check out this ability to automatically reacquire on the S band, and what we want to do is to secure our uplink carrier for about 30 seconds. Then we will turn it back on and see if the spacecraft equipment will automatically reacquire. So if you do not get a call from us within about 3 minutes, that means we have not been able to reacquire and request your assistance on a manual acquisition. Over.

03 13 10 04 LMP

Okay. We understand.

03 13 10 11 CC

11, Houston. We also would appreciate - if you will note the angles that the antenna tracks through in its attempt to reacquire. Over.

03 13 10 26 LMP

Roger. We'll do that.

03 13 13 28 CC

11, Houston. It looks like we're locked back up again with no delay. How does it look on board? Over.

03 13 13 37 LMP

Roger. The signal strength dropped very rapidly to zero; and the pitch and yaw, in about 3 seconds, moved toward 40 degrees pitch and 240 degrees yaw. Right now, they're sitting on about 15 degrees pitch and about 265 degrees yaw. So they didn't move very far, about 30 degrees apiece; and then they picked right back on up again. Over.

03 13 14 19 CC

Roger. Some of "The Luckiest People" in the background there. We copied your pitch and yaw angles.

03 13 15 27 CC

11, Houston. Could you give us the location of your - pitch and yaw location of your position indicators? Over.

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03 13 15 39 LMP

Roger. They're in the same position as the antenna right now; plus 15 degrees pitch and - no, now wait a minute. I got them - got it at about 275 instead of 265.

03 13 15 57 CC

Okay. Thank you.

03 13 16 23 CC

11, Houston. We'd like to try the same procedure once more. We'll leave the carrier a little longer and be back up for a call within 4 minutes. Over.

03 13 16 35 LMP

Okay.

03 13 20 07 CC

11, Houston. We're locked back up again. Can you give us a report on how the antenna behaved?

03 13 20 24 LMP

Roger. It was essentially identical as before. The pitch went to 45, 40 to 45 and the yaw went to about - to about 255, 245 to 255; and then it rather quickly locked up at 15 degrees pitch and 270 yaw. Over.

03 13 20 49 CC

11, Houston. Roger. Your angles are 45 and 255. Do I understand that as soon as the carrier dropped, it went to these angles; or did it only go to these angles after the uplink carrier was reenabled and the antenna began to reacquire? Over.

03 13 21 12 LMP

No. As soon as the carrier dropped off, why, it drifted over into those angles and stayed there. Then when it came back up again, why, it hunted around for a while, but it didn't get any further off. Gradually brought it on in to the angles where it is right now; and then the signal strength would take several jumps as evidently it goes from wide to medium to narrow. Over.

03 13 21 38 CC

11, Houston. Understand. And on another subject, request you zero your optics for the night. Over.

03 13 21 58 LMP

Roger. Zeroed.

03 13 27 46 CC

Apollo 11, Houston. Can you confirm that you have changed the CO2 filter as per flight plan in the last hour? Over?

03 13 28 01 CMP

No. We're still eating. We're about to do it. We'll let you know.

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03 13 28 04 CC

Roger, 11. And we've got about 14 minutes until LOS. AOS is 86 30, an hour away. We're wondering whether or not you plan to have one man up at that time or would you all like to be asleep inside the next hour? Over.

03 13 28 25 CMP

Somebody will be up.

03 13 28 27 CC

Roger. The thing that we're still puzzling on is the antenna, and if - as long as there will be somebody up, why, we would like to have somebody check the automatic REACQ on the next AOS.

03 13 28 42 CMP

Okay. We'll do that. We haven't chlorinated the water yet, and we haven't changed the lithium hydroxide. We're just still finishing up dinner.

03 13 28 49 CC

Roger, Mike. Thank you.

03 13 40 07 CC

Apollo 11, Houston. We have LOS coming up in 2 minutes now, and AOS will be at 86 plus 28 plus 15. Over.

03 13 40 20 CDR

We'll see you on the other side, Houston.

03 13 40 21 CC

Roger.

END OF TAPE

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03 14 06 -- BEGIN LUNAR REV 6

03 14 30 37 CMP
Houston, Apollo 11. Over.

03 14 30 39 CC
11, Houston. Loud and clear here. Over.

03 14 30 44 CMP
Okay. We just appeared to get a solid lock for the last - oh, about a minute. The ... needle's been wandering up and down, and the pitch and yaw needles have been wandering around, but it appears to have reacquired by itself solidly now. We're just finishing up our fuel cell purge. Hydrogen on number 3 is the last to go off. It'll be coming off in just a second.

03 14 31 09 CC
Roger, 11.

03 14 32 17 CC
Apollo 11, Houston. We believe we've tracked down the reacquisition problem we had on the previous REV. It looks like it was a receiver power supply here on the ground and no problems in the spacecraft at all. Over.

03 14 32 35 CMP
Okay. Glad to hear it.

03 14 32 37 CC
11, that really winds things up as far as we're concerned on the ground, for the evening. We're ready to go to bed and get a little sleep. Over.

03 14 32 49 CMP
Yes. We're about to join you.

03 14 32 51 CC
Roger.

END OF TAPE

Tape 57/1 Page 264

03 16 05 -- BEGIN LUNAR REV 7

REST PERIOD - NO COMMUNICATIONS

Tape 58/1 Page 265

03 18 02 -- BEGIN LUNAR REV 8

REST PERIOD - NO COMMUNICATIONS

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03 20 01 -- BEGIN LUNAR REV 9

REST PERIOD - NO COMMUNICATIONS

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03 21 32 39 CC

Apollo 11, Apollo 11. Good morning from the Black Team.

03 21 33 01 CMP

Good morning, Houston.

03 21 33 04 CC

Good morning. We got about 2 minutes to LOS here, Mike.

03 21 33 12 CMP

... You guys wake up early.

03 21 33 15 CC

(Laughing) Yes, you're about 2 minutes early on the wakeup. Looks like you were really sawing them away.

03 21 33 23 CMP

You're right.

03 21 33 44 CC

11, Houston. For planning purposes, you can go ahead and take the monocular into the LM with you.

03 21 33 56 CMP

Okay. I'll tell them. How are all the CSM systems looking?

03 21 34 06 CC

11, Houston. Looks like the command module's in good shape. Black Team has been watching it real closely for you.

03 21 34 17 CMP

We sure appreciate that. Because I sure haven't.

03 21 34 27 CC

Say again.

03 21 34 34 CMP

I say because I sure have not.

03 21 34 37 CC

Roger.

03 21 35 01 CC

Apollo 11. Thirty seconds. AOS will be 94 plus 21.

03 21 35 11 CMP

94 21.

END OF TAPE

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03 21 59 -- BEGIN LUNAR REV 10

03 22 22 17 CC

Apollo 11, Houston. Standing by.

03 22 23 04 LMP

Houston, Apollo 11.

03 22 23 06 CC

Apollo 11, Houston. Go.

03 22 23 11 LMP

Roger. How do you read the BIOMED in the LMP with the LCG on? Over.

03 22 23 17 CC

Roger. Stand by, 11.

03 22 23 47 CC

Apollo 11, Houston. We have good data on all 3 crewmen. No. Belay that. The Commander we do not have yet.

03 22 24 00 LMP

Okay. He's not up yet.

03 22 50 00 LMP

Houston, Apollo 11. We just had a very good view of the landing site. We can pick out almost all of the features we've identified previously.

03 22 50 10 CC

11, Houston. Roger. Sounds real fine. And, 11, I have your maneuver PAD and consumables update whenever you want them.

03 22 50 30 SC

Stand by.

03 22 50 34 LMP

Stand by a little, please.

03 22 50 37 CC

Roger. We're standing by. And that's the block data on the maneuver PAD, by the way.

03 22 52 39 CMP

Houston, Apollo 11 is a couple of minutes away from this rolling right 40 degrees to roll 122, pitch 229, yaw 0. Over.

03 22 52 48 CC

Apollo 11, Houston. Roger. We're standing by.

03 22 54 04 CMP

Houston, Apollo 11. Ready to copy.

03 22 54 08 CC

Roger. Apollo 11, Houston. Here's your block data, TEI 30. Over.

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03 22 54 20 CMP

Ready to copy.

03 22 54 22 CC

SPS/G&N: 36639; your NOUN 48, minus 072, plus 051; your NOUN 33, 135 24 4000; NOUN 81, plus 32178, plus 06036, minus 01304, your pitch 064. The rest is NA. Ullage: two jet, 16 seconds; and it's based on LOI REFSMMAT. Over.

03 22 55 49 CMP

Roger. TEI 30 SPS/G&N: 36639 minus 072, plus 051, 135 24 4000, plus 32178, plus 06036, minus 01304, pitch 064, two jets 16 second, LOI REFSMMAT. Over.

03 22 56 15 CC

Apollo 11, Houston. Readback correct. Your consumables update?

03 22 56 36 CMP

Yes. Go ahead.

03 22 56 37 CC

Roger. GET 91 plus 30, minus 7 percent; Alfa minus 8, Bravo minus 2.5, Charlie minus 10, Delta minus 6.5. H2 total, minus 2 pounds; oxygen total, plus 9 pounds. Over.

03 22 57 18 CMP

Okay. Thank you. And on board, we're reading for quad Alfa 75 percent, Bravo 78, Charlie 78, and Delta 77 percent.

03 22 57 37 CC

11, Houston. We copy.

03 22 57 49 CC

Apollo 11, Houston. I have your base line altitude update now, if Buzz is ready to copy.

03 22 58 00 SC

...

03 22 58 02 CMP

Go ahead.

03 22 58 04 CC

Roger. Alfa 1 is 500, that's 500 feet above the landing site. Over.

03 22 58 23 CMP

Okay. Alfa 1 is 500 feet above the landing site. Thank you.

03 22 58 51 CMP

Houston, Apollo 11. Our crew status report for sleep: CDR 5.5, CMP 6.0, LMP 5.0. Over.

03 22 59 02 CC

Apollo 11, Houston. Roger. We have that now.

03 23 16 09 CC

Apollo 11, Houston. Over.

03 23 16 16 LMP

Houston, Apollo 11. Go ahead.

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03 23 16 18 CC

Roger. The "Black Bugle" just arrived with some morning news briefs if you're ready.

03 23 16 28 CDR

Go ahead.

03 23 16 30 CC

Roger.

03 23 16 31 CMP

...

03 23 16 32 CC

Okay. Church services around the world today are mentioning Apollo 11 in their prayers. President Nixon's worship service at the White House is also dedicated to the mission, and our fellow astronaut, Frank Borman, is still in there pitching and will read the passage from Genesis which was read on Apollo 8 last Christmas. The Cabinet and members of Congress, with emphasis on the Senate and House space committees, have been invited, along with a number of other guests. Buzz, your son, Andy, got a tour of MSC yesterday. Your Uncle Bob Moon accompanied him on the visit which included the LRL. Among the - -

03 23 17 27 LMP

- - Thank you.

03 23 17 28 CC

Roger. Among the large headlines concerning Apollo this morning, there's one asking that you watch for a lovely girl with a big rabbit. An ancient legend says a beautiful Chinese girl called Chang-o has been living there for 4000 years. It seems she was banished to the Moon because she stole the pill of immortality from her husband. You might also look for her companion, a large Chinese rabbit, who is easy to spot since he is always standing on his hind feet in the shade of a cinnamon tree. The name of the rabbit is not reported.

03 23 18 15 LMP

Okay. We'll keep a close eye out for the bunny girl.

03 23 18 19 CC

Roger. You residents of the spacecraft Columbia may be interested in knowing that today is Independence Day in the country of Colombia. Gloria Diaz of the Philippines was crowned Miss Universe last night. She defeated 60 other girls for the global beauty title. Miss Diaz is 18, with black hair and eyes, and measures 34-1/2, 23, 34-1/2. First runner up was Miss Australia, followed by Miss Israel, and Miss Japan. While you're on your way back Tuesday night, the American and

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National League Allstars will be playing ball in Washington. Mel Stottlemyre of the Yankees is expected to be the American League's first pitcher. No one is predicting who will be first pitcher for the National League yet. They have nine on the roster. Even though research has certainly paid off in the space program, research doesn't always pay off, it seems. The Woodstream Corporation, parent company of the Animal Trap Company of America which has made more than a billion wooden spring mousetraps, reports that it built a better mousetrap but the world didn't beat a door to its path - didn't beat a path to its door. As a matter of fact, the company had to go back to the oldfashioned kind. They said, "We should have spent more time researching housewives and less time researching mice". And the "Black Beag - Bugle" is all completed for the morning.

03 23 20 47 CDR

Thank you very much. We appreciate the news.

03 23 21 21 LMP

Black Team, we'll be looking for an interesting day with you all tomorrow.

03 23 21 27 CC

Roger. We'll be going off here shortly, and we'll pick you up in the morning for sure.

03 23 30 15 CC

Apollo 11, Houston. Three minutes to LOS; AOS at 96 plus 20.

03 23 30 27 CDR

Apollo 11. 96 20. Thank you.

END OF TAPE

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03 23 54 -- BEGIN LUNAR REV 11

04 00 21 24 CC

Hello, Columbia. Houston. Do you read? Over.

04 00 21 58 LMP

Hello, Houston, this is Eagle. How do you read? Over.

04 00 22 03 CC

Eagle, this is Houston. Are you calling? Over.

04 00 22 08 LMP

Roger. How do you read? Over.

04 00 22 11 CC

Roger. Reading you about three by, Buzz; a lot of noise on the loop. We think it's coming from Columbia, but we can't tell. We're unable to raise voice with him. Would he please go to high gain. Over.

04 00 22 26 LMP

Okay. I'll have him go to high gain. It's probably the glycol pump you hear in the background, and I'm up to the point where I turn on the IMU. Would you recommend I hold off here for a few minutes or go ahead and power up the IMU? Over.

04 00 22 41 CC

Roger. Stand by.

04 00 22 42 LMP

Hey, get your high gain to working.

04 00 22 46 CMP

Houston.

04 00 23 06 CC

Eagle, this is Houston. You can turn on the IMU. Over.

04 00 23 14 SC

...

04 00 23 21 CMP

Houston, this is Columbia.

04 00 23 31 CC

Columbia, this is Houston. Do you read? Over.

04 00 23 37 CMP

Houston ...

04 00 24 44 CC

Hello, Eagle. This is Houston. We've got a noisy downlink on the downvoice backup. Would you please select S band voice to VOICE? Over.

04 00 25 50 CC

Columbia, this is Houston. Do you read? Over.

04 00 25 57 CMP

Houston, Columbia. Reading you loud and clear. How me?

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04 00 26 00 CC

Roger. About three by, Mike. We've got a lot of noise in the background. It's clearing up now. Break. Eagle, Houston. Do you read? Over.

04 00 26 12 LMP

Houston, Eagle. About four by four. Go ahead.

04 00 26 15 CC

Roger. Just getting a voice check. Say the page you're on in the activation checklist. Over.

04 00 26 24 LMP

Roger. I'm on page 27. Over.

04 00 26 27 CC

Roger. Understand 27. We copy. Out.

04 00 27 07 CC

Columbia, this is Houston. Would you please give us P00 in ACCEPT. We have a state vector for you. Over.

04 00 27 15 CMP

Stand by one.

04 00 28 21 CMP

Houston, Columbia. You have P00 in ACCEPT, and how are you reading me now?

04 00 28 26 CC

Roger. Understand, we have P00 in ACCEPT. You're about three by in - on the voice, Mike. Over.

04 00 28 35 CMP

Okay. You're coming in loud and clear, and I'm configured for normal voice. If you've got any switch changes, let me know.

04 00 28 42 CC

Roger. We've got some noise somewhere in the system down here, I think. We're working on it. And I've got a 130 landmark update for you, and also a DAP load whenever you're ready to copy. Over.

04 00 28 59 CMP

Stand by one.

04 00 29 20 CMP

Go ahead with the 130 update.

04 00 29 22 CC

Roger, Mike. Coming at you with the 130, P1 is 98 37 35, P2 98 42 44, 4 miles north. Over.

04 00 29 52 CMP

Okay. P1 98 37 35, P2 98 42 44, 4 miles north of track; and go ahead with your DAP load.

04 00 30 04 CC

Roger. CSM weight 36651, LM weight 33627, pitch trim minus 0.72, yaw trim plus 0.51. Over.

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04 00 30 32 CMP

36651, 33627, minus 0.72, plus 0.51. Over.

04 00 30 40 CC

Both are good readbacks. Out.

04 00 30 46 LMP

Houston, Eagle. Are you satisfied with the LGC self test? Over.

04 00 30 52 CC

Roger. Understand. You passed the LGC self test. Over.

04 00 30 59 LMP

Negative. I was asking you if you were satisfied with it. As far as I can tell, it's satisfactory. And also the primary EVAP flow is actuated to number 1 at 96 05. Over.

04 00 31 11 CC

Roger. Copy on the primary EVAP. We've got the low bit rate, Buzz. We couldn't see that LGC self test. Over.

04 00 31 20 LMP

Okay.

04 00 31 27 CMP

Houston, Columbia. The docking tunnel index angle remains unchanged.

04 00 31 32 CC

Roger. Copy. Out.

04 00 32 07 LMP

Houston, Eagle is going to secondary transmitter/receiver and secondary power amplifier, and I'll check with you in 60 seconds. Over.

04 00 32 16 CC

Roger. Stand by. We're standing by. Over.

04 00 32 23 LMP

Okay.

04 00 32 29 CC

Columbia, Houston. We are through with the computer. You can go back to BLOCK. Over.

04 00 33 14 LMP

Houston, Eagle. On secondary transmitter/receiver and power amplifier, how do you read? Over. 1, 2, 3, 4, 5. Over.

04 00 33 21 CC

Roger. Reading you five by, Buzz. How me? 1, 2, 3, 4, 5; 5, 4, 3, 2, 1. Out.

04 00 33 30 LMP

Roger. That's about the same as before. Switching back to PRIMARY.

04 00 33 34 CC

Roger.

04 00 34 27 LMP

Houston, Eagle. Back on PRIMARY, and I'm ready to proceed with the steerable antenna activation.

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04 00 34 34 CC

Roger. We're standing by, Buzz. Go ahead. Over.

04 00 34 45 LMP

And I'll go to BIOMED left - right momentarily.

04 00 34 49 CC

Roger.

04 00 36 40 LMP

Houston, Eagle. Got a real nice lock on - lock on the steerable antenna, and you should be receiving BIOMED right and PCM high. Over.

04 00 36 53 CC

Roger, Eagle. We got you five by. It's really beautiful. We've got the high bit rate and the BIOMED. Out.

04 00 37 07 CC

Eagle, Houston. Do you copy? Over.

04 00 37 13 LMP

Roger. Copy.

04 00 39 26 LMP

Houston, Eagle. For your information, we're doing the glycol pump check now.

04 00 39 30 CC

Roger. Copy.

04 00 39 44 LMP

And there's the secondary glycol pump.

04 00 39 47 CC

Roger.

04 00 40 26 LMP

And I'm on secondary, or number 2 pump right now, and I'll hold here for a couple of seconds and then switch back to number 1.

04 00 40 35 CC

Roger.

04 00 42 47 CC

Columbia, Houston. Over.

04 00 42 51 LMP

Houston.

04 00 42 54 CMP/LMP

Go ahead, Houston.

04 00 42 56 CC

Roger, Columbia. We noticed your DAP configuration. We'd like you to turn off B3 and C4, Mike, and for register 2 in the DAP, we'd like all ones. Over.

04 00 43 21 CMP

B3 and C4 are both off on panel 8 and I understand you want - Say again what you want on register 2.

04 00 43 29 CC

Roger. In the DAP, we'd like you load all ones. Over.

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04 00 43 36 CMP

All right.

04 00 44 08 CC

Columbia, Houston. Did you hit the COMMAND RESET around - after LOS on the last pass? Over.

04 00 44 19 CMP

That's affirmative. When we were having difficulty getting you, Charlie, I pushed the COMMAND RESET to make sure I had control of high gain.

04 00 44 26 CC

Roger. Thank you much. We're in good shape now. Over.

04 00 44 31 CMP

Okay.

04 00 46 19 LMP

Houston, Eagle. Can you tell me if you're picking up BIOMED on the CDR now? Over.

04 00 46 26 CC

Stand by.

04 00 46 44 CC

Eagle, Houston. We're not getting any BIOMED from the CDR now. Over.

04 00 46 53 LMP

Roger. Understand.

04 00 47 58 CC

Eagle, Houston. We got the BIOMED on the commander now. Over.

04 00 48 06 LMP

Very good. Thank you.

04 00 49 19 LMP

Houston, Eagle. We're ready for an E memory dump if you are. Over.

04 00 49 23 CC

Roger. We're ready. Go.

04 00 49 58 CC

Eagle, this is Houston. We see the optics zero switch on. Before you take some marks, don't forget to cycle it back off and on, and then on. Over.

04 00 50 12 LMP

Roger. Houston, Eagle here. I wish we had one of those optics. I'll tell Mike about it.

04 00 50 18 CC

Roger, Columbia. Excuse me. Sorry about that.

04 00 57 04 CC

Eagle, Houston. Could you give us a hack on the time that you switched to LM power and also verify that we're on glycol pump 1. Over.

04 00 57 20 CDR

This is Eagle. We're on pump 1, stand by for the switchover time.

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04 00 57 26 CC

Roger.

04 00 57 57 CDR

The switch time to LM power is 95 54 00. Over.

04 00 58 03 CC

Roger. Copy, Neil. Is Buzz back in the Columbia now? Over.

04 00 58 10 CDR

Yes. He is.

04 00 58 12 CC

Roger. Thank you.

04 01 00 04 CDR

Hello, Columbia, this is Eagle on Simplex B. How do you read?

04 01 00 10 CMP

You are loud and clear in Simplex B, Neil.

04 01 00 13 CDR

Roger. Read you loud and clear.

04 01 00 24 CDR

Okay. Would you configure for Simplex A, please?

04 01 00 30 CMP

Roger. Going to Simplex A.

04 01 01 05 CDR

Columbia, Eagle. How do you read on VHF A?

04 01 01 09 CMP

Reading you loud and clear on A.

04 01 01 11 CDR

Roger. Read you loud and clear.

04 01 01 22 CDR

And I'm ready to get a time hack from you. Load the CSM time.

04 01 01 29 CMP

Okay.

04 01 01 42 CMP

Do you want the T EPHEM first?

04 01 01 46 CDR

Let's get your clock first and then we'll get T EPHEM.

04 01 01 50 CMP

Okay.

04 01 01 53 CDR

Give me a time for load.

04 01 01 59 CMP
97 01 30. Correction on that, Neil. 97 - make that 97 03 30.

04 01 02 23 CDR
Okay. I have 97 03 30 set in.

04 01 02 27 CMP
Okay. And you've got about a minute to go.

04 01 02 29 CDR
Okay.

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04 01 03 17 CMP
15 seconds to go. 10. 5, 4, 3, 2, 1.

04 01 03 32 CMP
1.

04 01 03 33 CMP
MARK it.

04 01 03 34 CMP
97 03 30.

04 01 03 35 CDR
Got it.

04 01 03 46 CDR
Okay. Let's do a 0665 on my Mark.

04 01 03 59 CDR
Did you get that, Mike?

04 01 04 01 CMP
Standing by for your Mark.

04 01 04 03 CDR
Okay, 3, 2, 1.

04 01 04 06 CDR
MARK.

04 01 04 08 CMP
Okay. 97 04 03.86.

04 01 04 20 CDR
Okay. I'm within three hundredths. That's within our ability to keep together, I think.

04 01 04 26 CMP
Roger.

04 01 04 46 CDR
Okay. Now you want to give me T EPHEM VERB 05, NOUN 01 ENTER?

04 01 04 56 CMP
Okay. I've got VERB 05, NOUN 01, ENTER. Going to 17 06 ENTER.

04 01 05 00 CDR

Roger.

04 01 05 04 CMP

Are you ready to copy?

04 01 05 06 CDR

Go ahead.

04 01 05 07 CMP

Roger. Register 1, 5 balls; register 2, 20017; register 3, 20616. Over.

04 01 05 20 CDR

Understand R1, 5 zeros; R2, 20017; R3, 20616.

04 01 05 28 CMP

That's correct.

04 01 05 43 CMP

And I'm standing by configured to record your PCM data.

04 01 06 37 CDR

And I'm ready to start on a docked IMU coarse align when you are; and when you're ready, go MIN deadband ATT hold.

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04 01 06 50 CMP

Okay. Stand by.

04 01 08 13 CMP

We're minimum deadband, attitude hold.

04 01 08 21 CDR

Okay. Now I need your NOUN 20.

04 01 08 31 CMP

Okay. I got VERB 06, NOUN 20. Give me a Mark on it.

04 01 08 37 CDR

Okay.

04 01 08 38 CDR

MARK.

04 01 08 42 CMP

Register 1, plus 11202, plus 20741, plus 00211. Over.

04 01 08 57 CDR

Copy. 11202, 20741, 00211.

04 01 09 05 CMP

That's correct.

04 01 11 34 CC

Eagle, Houston. That coarse align looked good to us. Over.

04 01 11 40 CDR

Roger.

04 01 11 52 CDR

Okay, Mike. Your attitude hold's no longer required.

04 01 11 58 CMP

Thank you.

04 01 13 55 CDR

Okay, Mike. I'd like to copy a NOUN 20 again, 06 NOUN 20. Be on my Mark.

04 01 14 07 CMP

Standing by for your Mark.

04 01 14 09 CDR

3, 2, 1; stand by. Take it again.

04 01 14 18 CMP

Okay.

04 01 14 19 CDR

3, 2, 1.

04 01 14 22 CDR

MARK.

04 01 14 24 CMP

Okay, I read plus 11154, plus 20792, plus 00230. Over.

04 01 14 38 CDR

I get - You get 11154, 20792, 00230.

04 01 14 48 CMP

That's correct.

04 01 15 06 CC

Eagle, Houston. I -

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04 01 15 07 CDR

Okay, Houston. Did you copy -

04 01 15 10 CC

Eagle, Houston. We have the angles. I'll read them back. Over. For the command module, 11154, 20792, 00230. For the LM, 18995, 02852, 35863. Over.

04 01 15 34 CDR

That's correct for Eagle and command module.

04 01 15 36 CC

Roger.

04 01 15 42 CDR

Did you get the time? Was 97 14 20.

04 01 15 45 CC

Roger. Copy, Eagle. Out.

04 01 17 08 CC

Columbia and Eagle: LOS for both spacecrafts 97 32, AOS 98 18. Houston, out.

END OF TAPE

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04 01 21 35 CC

Eagle, Houston. We have your gyro torquing angles if you're ready to copy. Over.

04 01 21 47 CDR

Roger. We're ready to copy.

04 01 21 59 CC

Roger. Eagle. For X minus 00060, Y plus 00620, Z plus 01080. Over.

04 01 22 34 CDR

Understand. X minus 00060, Y plus 00620, Z plus 01080.

04 01 22 50 CC

Roger, Eagle. Good readback. Out.

04 01 24 18 CDR

Houston, this is Eagle. Do you want us to go ahead and do a VERB 42 at this time?

04 01 24 28 CC

Stand by. That's affirmative, Eagle. We'd like you to go ahead and fine align. Over.

04 01 24 37 CDR

Okay.

04 01 24 48 LMP

Houston, Eagle, LMP. How do you read? Over.

04 01 24 49 CC

Roger. Five by, Buzz. How me? Over.

04 01 24 54 LMP

Loud and clear. I'm going to be going through an ascent battery check. You want to check my BIOMED's briefly? Over.

04 01 25 01 CC

Roger. Go ahead.

04 01 25 17 CC

Eagle, Houston. We got a good BIOMED on you, Buzz. Over.

04 01 25 26 LMP

Okay. Let me know where it ought to be at this point.

04 01 25 29 CC

Roger. You can stay there at that point. When we go LOS, we'd like you to go off on the BIOMED. Over.

04 01 25 39 LMP

Roger.

04 01 25 53 CDR

Do you copy those angles, Houston - torquing angles?

04 01 25 57 CC

Roger. They're correct. You can torque. Over.

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04 01 27 43 CC

Apollo 11, Houston. We have about 4 minutes LOS. That makes AOS 98 18. Over.

04 01 27 54 CDR

Eagle. Roger.

04 01 27 58 CMP

Columbia. Roger.

04 01 28 31 CMP

Eagle, Columbia.

04 01 28 39 CDR

Columbia, Eagle. Go ahead.

04 01 28 41 CMP

Roger. The capture latch is in the probe or engaged in the drogue. Would you like to set them from your side?

04 01 28 51 CDR

Roger. Stand by.

04 01 28 57 LMP

Houston, Eagle. ED battery A is 37.0 and battery B is 36.9. Over.

04 01 29 04 CC

Roger. Copy both of those, Buzz. Out.

04 01 29 20 CC

Eagle, Houston. We looked at the E memory. It's GO. Over.

04 01 29 26 LMP

Roger. E memory GO.

04 01 29 41 CDR

Mike, the capture latches look good.

04 01 29 44 CMP

Thank you.

04 01 29 54 CC

Eagle, Houston. We'd like you to go to the OMNI antenna, and next AOS, we'd like you to be in forward. Over.

04 01 30 06 LMP

Roger. Going to - which OMNI do you want now, aft?

04 01 30 20 CC

Eagle, Houston. We'd like aft now and forward at AOS. Over.

04 01 30 27 LMP

Roger.

04 01 31 05 CC

Apollo 11, Houston. Thirty seconds to LOS. Both spacecraft looking good going over the hill. Out.

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04 01 55 -- BEGIN LUNAR REV 12

04 02 18 21 CC

Apollo 11, Houston. We're standing by. Over.

04 02 19 10 CC

Columbia, Houston. Do you read? Over.

04 02 19 30 CC

Eagle, Houston. Do you read? Over.

04 02 20 19 CC

Columbia, Houston. Over.

04 02 20 53 CC

Eagle, Houston. No voice. Will you verify forward OMNI? Over.

04 02 21 58 CC

Columbia, Houston. We have no voice with Eagle. Would you please verify that Eagle is on forward OMNI. Over.

04 02 22 36 CC

Columbia, Houston. Over.

04 02 23 10 CC

Eagle, Houston. Over.

04 02 23 16 LMP

Houston, Eagle. Go ahead.

04 02 23 17 CC

Roger. Are you reading me, Buzz? Over.

04 02 23 22 LMP

Roger. I've got you now. I fed in those angles for the S band but I couldn't get a lockon because the antenna would be looking through the LM in order to reach the Earth. Over.

04 02 23 41 CC

Roger. We copied in the P22 attitude that you will not be able to get a high gain lockon. We have a DAP data load, if you're ready to copy. Over.

04 02 24 05 LMP

Roger. Ready to copy.

04 02 24 07 CC

Okay. LM weight 33627, CSM weight 36651, pitch trim 00470, roll trim 00589. Over.

04 02 24 34 LMP

Roger. LM weight 33627, CSM weight 36651, pitch trim 00470, roll trim 00589. Over.

04 02 24 49 CC

Roger, Buzz. That's a good readback. You're about two by with these OMNI's in this configuration; we won't have very good COMM until we get through with the P22. Over.

04 02 25 02 LMP

Roger. Understand.

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04 02 25 13 CC

Eagle, Houston. Would you select S band voice to VOICE. Over.

04 02 25 57 CMP

Houston, Columbia. Downvoice backup. Do you read?

04 02 25 59 CC

Roger. We read you. Columbia, did you call? Over.

04 02 26 06 CMP

Affirmative. Downvoice backup. How do you read me?

04 02 26 08 CC

Roger. Better, Mike. We're reading you now about four by. No voice at all with you earlier. Let's stay in this configuration. Eagle, are you in VOICE mode? Over.

04 02 26 22 LMP

Roger. Eagle is in VOICE mode. How do you read? Over.

04 02 26 25 CC

Roger. You're about three by now, Buzz. We're satisfied with this COMM configuration. Let's stay with where we are. Over.

04 02 26 36 CMP

Houston, Columbia is in OMNI Charlie downvoice backup, and if you get a chance, would you look up the coordinates of 130 for me, please? I have been - conflicting information between my cue card and my flight plan. I'd like to know which coordinate values you want me to use.

04 02 26 51 CC

Roger. Stand by.

04 02 27 07 LMP

Houston, Eagle. Completed gear extension okay.

04 02 27 46 CC

Columbia, Houston. We're satisfied with what you already have loaded in P22 for these coordinates. Over.

04 02 27 56 CMP

Thank you, Houston.

04 02 29 00 CC

Columbia, Houston. The coordinates you have loaded in P22 are - we have - are Site 130 prime. Do you concur? Over.

04 02 29 17 CMP

I have the coordinates loaded on the cue card which are for crater 130.

04 02 30 03 CC

Columbia, Houston. We made an error on those coordinates. We'd like you to load for latitude

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in a NOUN 89 plus 01 243, longitude over 2 plus 11 844, altitude minus 001 46 as shown in the flight plan. Over.

04 02 31 30 CMP

Okay, Houston.

04 02 33 06 CC

Eagle, Houston. Could you give us an idea where you are in the activation? Over.

04 02 33 13 LMP

Roger. We're just sitting around waiting for something to do. We need a state vector, a REFSMMAT, a reading on the AGS. And we need you to watch our DAP load, give a voice check, and throttle check. Over.

04 02 33 34 CC

Roger. Eagle, we'll have the state vectors and the REFSMMAT as soon as we get the high gain. Over. It will be about another 10 minutes or so before we get through the P22, and when we maneuver to attitude and get the high gain, we'll have the updates for you. Over.

04 02 33 56 LMP

Roger. We'll go ahead with the DAP and throttle ... check if you don't have the gimble drive check, okay?

04 02 34 04 CC

Roger. Understand you're going to the DAP throttle check. That's affirmative.

04 02 35 32 CMP

Houston, Columbia. These T1 and T2 times are still good, aren't they?

04 02 35 37 CC

Say again. Over.

04 02 35 42 CMP

I say the T1 and T2 times remain unchanged, don't they?

04 02 35 51 CC

That's affirmative. Over.

04 02 35 55 CMP

Thank you.

04 02 37 58 LMP

Houston, Eagle.

04 02 38 01 CC

Go ahead, Eagle. Over.

04 02 38 05 LMP

Roger. In the first of - on page 47, step 1, we had the guidance control in PGNS and mode control PGNS AUTO and, of course, the circuit breakers are not in on the thrusters yet. So when we started through the DAP and proceeded on NOUN 46 - and we're looking at NOUN 47 now,

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so we've got an RCS TTA light and we've got four out of the eight other bright colored red flags. I think that this is explained by the fact that we are in PGNS and AUTO and unable to fire the thrusters.

04 02 38 51 CC

Roger. Stand by.

04 02 39 13 CC

Eagle, Houston. You are correct. The lights are there and the flags because we haven't closed the breakers yet. Over.

04 02 39 23 LMP

Roger.

04 02 40 02 CDR

And Houston, Eagle. Are you going to use the high gain before you can look at our GDA position indicator?

04 02 40 12 CC

Stand by.

04 02 40 35 CC

Eagle, Houston. We can see all the throttle data - -

04 02 40 37 MS

I can give high ...

04 02 40 40 CC

Go ahead. Over.

04 02 40 43 CDR

I could give you high bit rate on the OMNI if that would help any.

04 02 40 47 CC

Negative. We have all the throttle data we need. You can stay low bit rate. You can proceed through the throttle test, but do not do the gimbal trim. Over. Repeat, do not do the gimbal trim.

04 02 41 01 CDR

Roger. Understand.

04 02 41 41 CMP

Boy, you just can't miss those check points, Diamondback and Sidewinder.

04 02 42 23 CMP

AUTO optics are pointed just a little bit north of crater 130.

04 02 42 29 CC

Roger. Copy, Columbia, Out.

04 02 42 33 CMP

...

04 02 44 15 LMP

Houston, Eagle. We are ready to pressurize the RCS. Over.

Tape 63/7 Page 287

04 02 44 21 CC

Stand by.

04 02 44 40 CC

Eagle, Houston. You can go ahead with your RCS pressurization, but we would like to hold off on RCS checkout until we get the high bit rate. Over.

04 02 44 52 LMP

Roger.

04 02 44 54 CC

And Eagle, Houston. Have you deployed the landing gear yet? Over.

04 02 44 59 LMP

That's affirmative. The landing gear is out and ...

04 02 45 04 CC

Roger.

04 02 45 55 CMP

Houston, Columbia. I've completed my marks. I've gone ACCEL COMMAND in all three axes to prevent that thruster firing that last time.

04 02 46 03 CC

Roger.

04 02 46 49 CMP

Houston, Columbia. Say again on the necessary data on the downlink. Let me know and I'll proceed.

04 02 46 55 CC

Columbia, stand by on the NOUN 49. Over.

04 02 47 00 CMP

Standing by, Houston.

04 02 47 18 CC

Columbia, Houston. We got your NOUN 49; you can proceed. Over.

04 02 47 23 CMP

Roger.

04 02 47 38 CC

Colum - correction, Eagle, Houston. We see the MASTER ARM, you can go ahead and press. We see the press now. Over.

04 02 47 49 LMP

Roger. Looks good.

04 02 47 51 CC

Roger, Buzz. If you've got - would like, I've got your AGS abort constants. Over.

04 02 48 01 LMP

Ready to copy.

04 02 48 03 CC

Roger. For your AGS address 224, plus 60267; 225, plus 58148; 226, plus 70312; 227, minus 50031. Over.

Tape 63/8 Page 288

04 02 48 35 LMP

Roger. 224, plus 60267; 225, plus 58148; 226, plus 70312; 227, minus 50031. Over.

04 02 48 52 CC

Roger. Good readback. Out.

04 02 49 19 CMP

Eagle, Columbia. My P22 is complete. I'm continuing this maneuver to AGS CAL attitude.

04 02 49 25 CC

Roger. Fine. We copy.

04 02 49 28 LMP

Roger.

04 02 49 30 CC

Eagle, Columbia. Your high gain angles are - Corrected - Eagle, Houston. Your high gain angles are 165 pitch, yaw 66. Over.

04 02 49 47 LMP

Roger. ...

04 02 50 16 LMP

Stand by about another ...

04 02 51 13 LMP

Houston, Eagle. I think I've got you on the high gain antenna now. AGS are go.

04 02 51 36 CC

Columbia, Houston. If you go to REACQ on the high gain, we can acquire you now. Over.

04 02 52 24 CC

Eagle, Houston. We got some loads for you if you'll give us P00 and DATA. Over.

04 02 52 32 LMP

You've got P00 and DATA.

04 02 52 35 CC

Roger. We've got both of you on the high gains now. It sounds great now. Over.

04 02 52 43 CMP

Copy. Roger.

04 02 52 46 CC

Columbia, Houston. I have a SEP PAD if you're ready to copy. Over.

04 02 52 54 CMP

Stand by one.

04 02 53 18 CMP

Ready to copy.

04 02 53 19 CC

Roger, Mike. SEP PAD, RCS/G&N: NOUN 47 and NOUN 48 are NA, NOUN 33, 100 395 000, NOUN 81 is NA, roll 000 007 000. Rest of PAD is NA.

Tape 63/9 Page 289

04 02 53 58 CMP

SEP, RCS/G&N at a TIG of 100 39 50: roll 0, pitch 007, yaw 0. Over.

04 02 54 08 CC

Roger. Good readback.

END OF TAPE

Tape 64/1 Page 290

04 02 54 49 CDR

Houston, Eagle. Are you ready for us to start the RCS checkout now?

04 02 55 03 CC

As soon as we finish the uplink. Stand by one. Over.

04 02 55 11 CDR

Okay.

04 02 55 45 CMP

Houston, Columbia. Comment on P22. Worked just fine. The crater I marked on is a small crater down inside crater 130 as described by John Young.

04 02 55 57 CC

Roger. We copy.

04 02 56 06 CC

Eagle, Houston. On our load - during our load, we had to do a VERB 96 to stop integration. We're going to start over again on this load. Over.

04 02 56 19 CDR

Eagle. Roger.

04 02 56 22 LMP

And, Eagle, here. I have read out address in the AGS 404, 405 and 406, and I had believed that 405 and 406 would both be all zeros, and I would propose maybe that I reset them to zero. I realize that 404 should be a negative number, and it is minus 13495. Over.

04 02 56 51 CC

Roger. Copy.

04 02 57 23 CC

Eagle, Houston. Over.

04 02 57 28 LMP

Go ahead.

04 02 57 31 CC

Buzz, we've got - The only thing we're missing here is the drift check. After we finish our load, we'd like you to do the drift check with Columbia. Over.

04 02 57 44 CDR

GO.

04 02 58 05 CC

Eagle, Houston. The 404, 405, 406 look fine to us. Over.

04 02 58 18 LMP

Roger. I am going to be setting them up to zero for the undocking. The question is do you want me to reset 404, 405, 406 back to the numbers that they are now, or can I leave them zero? I intend to set 404 to a minus 13495. Over.

Tape 64/2 Page 291

04 02 58 38 CC

Stand by.

04 02 59 33 CC

Eagle, Houston. We would like you to zero, as called out in the timeline, all three addresses, 404, 405, 406, before undocking. After docking you can load them back to the values that you have right now. Over.

04 02 59 54 LMP

Eagle. Roger.

04 03 00 13 LMP

And, Houston, Eagle here. Both RCS helium pressures are reading 2900. Over.

04 03 00 23 CC

Copy. Out.

04 03 01 30 CC

Eagle, Houston. Over.

04 03 01 35 LMP

Go ahead.

04 03 01 36 CC

Roger, Buzz. There seems to be some confusion here on 405 and 406. We'd like you to zero them out prior to undocking, and after undocking you can - we'd like them still zeroed. Over.

04 03 01 52 LMP

Roger. I agree with that. Thank you.

04 03 01 55 CC

Yes.

04 03 03 25 CC

Eagle, Houston. We've got the load in the - We have reselected P00; your integration is going again for you; the computer is yours. We'd like to do the drift check now. Over.

04 03 03 37 CDR

Roger. In work.

04 03 03 39 CDR

Columbia, let's flick it in 0620 when you are ready.

04 03 03 48 CMP

Standing by until your Mark, Neil.

04 03 03 57 CDR

Okay. 3, 2, 1.

04 03 04 02 CDR

MARK.

04 03 04 05 CMP

358.1.64, 020.73, 359.54. Over.

04 03 04 20 CDR

Copy. 358.64 020.73 and 359.54.

04 03 04 27 CMP

That's correct.

04 03 04 38 CC

Eagle, Houston. We've copied the angles and will read back if you are ready. Over.

Tape 64/3 Page 292

04 03 04 47 CDR

Go ahead.

04 03 04 48 CC

Roger, Neil.

04 03 04 49 CC

For the CM - for Columbia: 35864, 02073, 35954.

04 03 04 58 CC

For Eagle: 30374, 20078, 00053. Over.

04 03 05 09 CDR

That's correct, and GET was 99 hours and 4 minutes even.

04 03 05 13 CC

Roger. Copy. Out.

04 03 06 08 CC

Eagle, Houston. Have you initialized the AGS yet? Over.

04 03 06 17 LMP

Negative. I haven't had a state vector yet.

04 03 06 21 CC

Roger, Buzz. Have you done the 377 yet?

04 03 06 27 LMP

Roger. Standing by for your K factor.

04 03 06 30 CC

Roger. Stand by.

04 03 06 37 CC

Columbia, Houston. We have got a load for you. Could we have P00 and ACCEPT? Over.

04 03 06 45 CMP

You got it.

04 03 06 47 CC

Roger. Thank you, Mike. And break. Eagle, we've got a K factor for you. Over.

04 03 07 00 LMP

Roger. Ready to copy.

04 03 07 02 CC

Roger, Buzz. K factor coming at you: 90 00 00 15. Over.

04 03 07 18 LMP

Roger. 90 00 00 15.

04 03 07 24 CC

Roger. That's good. That's a good ENTER there.

04 03 09 13 CC

Eagle, Houston. We recommend the AGS initial - Well, we see it coming up now on the AGS initialization. Over.

04 03 09 22 LMP

Roger.

04 03 09 28 CC

Eagle, Houston. After the AGS initialization, we'll be ready for the RCS checkout.

04 03 09 36 LMP

Roger.

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04 03 09 42 CC

Columbia, Houston. We got the load in. You can go back to BLOCK.

04 03 09 48 CMP

Thank you.

04 03 11 29 CC

Columbia, Houston. Did you get a - copy any LM data, low bit rate, behind the Moon? Over.

04 03 11 39 CMP

That's affirmative.

04 03 11 42 CC

Roger. Stand by.

04 03 11 48 CMP

Or at least I've configured for it. I'm not sure Eagle sent it or not.

04 03 11 51 LMP

No, we did not send V data. Eagle. Over.

04 03 11 55 CC

Roger. Copy.

04 03 13 58 CC

Eagle, Houston. The alignment and the initialization looked good to us. Over.

04 03 14 11 LMP

Roger. Thank you.

04 03 15 27 CC

Apollo 11, Houston. LOS is 99 30; next AOS 100 16. Over.

04 03 15 43 LMP

100 16. Roger.

04 03 16 31 CMP

Eagle, Columbia. Let me know when you come to your RCS hot fire checks so I can disable my roll.

04 03 16 37 CDR

Wilco.

04 03 16 38 LMP

Roger. We're right there now. And we'd like you - CSM in MID deadband ATT hold. Over.

04 03 16 44 CMP

That's where I am.

04 03 16 46 LMP

And, Houston, you have high bit rate with us now, I believe? We're ready to proceed with the RCS checks.

04 03 16 54 CC

Roger, Eagle. We're standing by. We're ready. Over.

04 03 18 57 LMP

Columbia, we'd like wide deadband ATT hold. Over.

04 03 19 02 CMP

Okay. Going wide deadband ATT hold.

04 03 19 12 CMP

You got it.

Tape 64/5 Page 294

04 03 19 17 CMP

Are you going to do your hot fire now?

04 03 19 20 LMP

Roger.

04 03 19 21 CMP

Okay. I'm disabling my roll.

04 03 19 31 CMP

Roll is disabled.

04 03 19 34 LMP

Roger.

04 03 21 07 CMP

Roger. Would you believe you've got thrusters on board that vehicle.

04 03 22 04 CMP

Give me a call just as soon as your hot fire is complete, please.

04 03 22 09 CDR

Wilco.

04 03 24 13 LMP

Houston, Eagle. The RCS hot fire is complete. How did you observe it? Over.

04 03 24 18 CC

Stand by. Eagle, Houston. The RCS hot fire looks super to us. We're all GO.

04 03 24 32 LMP

Roger. Mike, would you confirm that thrusters B3 and C4 are off? Over. And your radar transponder off.

04 03 24 42 CMP

C4 is off; B3 is off. Transponder is to HEATER which is the same as being off, and I've got my roll jets back on now.

04 03 24 50 CDR

And you're maneuvering. Right?

04 03 24 53 CMP

Will be shortly, Neil.

04 03 25 00 CC

Apollo 11, Houston. We're GO for undocking. Over.

04 03 25 08 LMP

Roger. Understand.

04 03 26 39 CMP

Starting a trim maneuver to AGS CAL attitude.

04 03 28 05 CMP

Houston, Columbia.

04 03 28 07 CC

Go ahead, Columbia. Over.

04 03 28 12 CMP

Roger. There will be no television of the undocking. I have all available windows either full of heads or cameras, and I'm busy with other things.

04 03 28 19 CC

We concur. Over.

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04 03 28 23 CMP

Okay.

04 03 28 24 CC

And, Eagle, Houston. We'd like you to select aft OMNI now. It will be good for both LOS and AOS. Over.

04 03 28 33 LMP

Roger. Going to aft OMNI.

04 03 29 07 CC

Apollo 11, Houston. One minute to LOS.

04 03 29 13 CMP

Columbia. Roger.

04 03 29 18 CDR

... Columbia. Systems looking good.

04 03 51 -- BEGIN LUNAR REV 13

04 04 17 06 CC

Hello, Eagle. Houston. We're standing by. Over.

04 04 17 51 CC

Eagle, Houston. We see you on the steerable. Over.

04 04 18 01 CDR (EAGLE)

Roger. Eagle is undocked.

04 04 18 03 CC

Roger. How does it look, Neil?

04 04 18 04 CDR (EAGLE)

The Eagle has wings.

04 04 18 06 CC

Roger.

04 04 18 08 CDR (EAGLE)

Looking good.

04 04 18 09 CC

Roger, Neil. We got a - If you will give us P00 and DATA, we've got the loads for you.

04 04 18 20 LMP (EAGLE)

Okay. You've got it. P00 and DATA.

04 04 18 24 CC

Roger. Let us know when you are ready to copy. We have a DOI PAD, and a PDI PAD. Over.

04 04 18 41 CDR (EAGLE)

You check our tracking light, Mike?

04 04 19 02 CDR (EAGLE)

Back off? Okay. I'm ready to start my yaw maneuver if it suits you, Mike.

04 04 20 06 CDR (EAGLE)

Does it look like you are going to be able to do this without burning thrusters, Mike?

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04 04 20 28 LMP (EAGLE)

Go ahead, Houston. Eagle is ready to copy.

04 04 20 32 CC

Roger, Eagle. Coming at you with a DOI PAD: 101 36 14.07. NOUN 81, minus 00758, plus all balls, plus 00098 plus - correction, 00572, perigee plus 00085 00764 030 000 293. NOUN 86, minus 00759, plus all balls, plus 00090. Rest of the PAD is NA. Stand by on your readback. If you are ready to copy the PDI data, I have it for you. Over.

04 04 20 51 LMP (EAGLE)

Go ahead.

04 04 21 55 CC

Understand you are ready to copy the PDI data, Eagle. Over

04 04 22 01 LMP (EAGLE)

That's affirmative. Go ahead with the PDI.

04 04 22 05 CC

Roger. PDI PAD: TIG 102 33 04.36 09 50, minus 00021, 182 287 000, plus 56919. PDI aort, less than 10 minutes, 105 12 30.00. PDI absrt, greater than 10 minutes, 103 40 00.00 107 11 30.00. No PDI plus 12: 102 44 27.00. NOUN 81 plus 01223, minus all balls, plus 01889 01520 plus 00110 02250, burn time 046 000 190, plus 01187, plus all balls, plus 01911. NOUN 11 103 31 07.00. NOUN 37 105 12 30.00. Ready for your readbacks, Over.

04 04 24 39 CC

Eagle, Houston. We are through with the computer. You can go, back to BLOCK. Over.

04 04 24 49 LMP (EAGLE)

Roger. Back to BLOCK; and REALIGN: 101 36 14.07 minus 00758, plus all zeros, plus 00098 00572, plus 00085 00764 030 000 293, minus 000759, plus all zeros, plus 00090. NA. Over.

04 04 25 33 CC

That was a good readback, Buzz. Go ahead. Over.

04 04 05 42 LMP (EAGLE)

Okay. PDI PAD: 102 33 04.36, 09 50, minus 00021 182 287 000, plus 56919. PDI less than 10: 105 12 30.00. PDI greater than 10: 103 40 00.00 107 11 30.00. No PDI plus 12 abort: 102 44 27.00, plus 01223, minus all zeros, plus 01889 01520, plus 00110 02250 046 000 190, plus 01187, plus 00000, plus 019011 103 31 07.00 105 12 30.00. Over.

04 04 27 24 CC

Roger. Good readback, Buzz. Out.

END OF TAPE

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04 04 29 02 CMP (COLUMBIA)

Neil, I'm maneuvering in roll.

04 04 29 04 CDR (EAGLE)

Roger. I see you.

04 04 29 10 LMP (EAGLE)

Houston, Eagle. Are you copying the very large numbers for range and range rate in VERB 83? And did you just give us a state vector that changed one of the two vehicles? Over.

04 04 29 28 CC

Roger, Eagle. We gave you a LM state vector. We have not changed the CSM state vector, however. Over.

04 04 29 40 LMP (EAGLE)

Okay. That explains it. Over.

04 04 30 16 CC

Columbia, Houston. On my Mark 9 30 to ignition.

04 04 30 19 CC

MARK.

04 04 30 20 CC

9 30.

04 04 30 53 CC

Eagle, Houston. Would you have Columbia go to the high gain, yaw 0, pitch minus 20. Over.

04 04 31 05 CDR (EAGLE)

You want him to go to high gain yaw 0? Say again the numbers.

04 04 31 13 CC

Roger, Neil. Yaw 0, pitch minus 20, high gain angles. Over.

04 04 31 20 CDR (EAGLE)

Okay. Yaw 0, pitch minus 20 on the high gain.

04 04 31 23 CC

That's affirmative. We've lost all data with him.

04 02 31 25 CDR (EAGLE)

To Columbia?

04 02 31 29 CDR (EAGLE)

He says he'll do that as soon as he gets around there.

04 02 31 32 CC

Roger.

04 04 31 45 CDR (EAGLE)

Okay.

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04 04 32 36 CC

Columbia, Houston. How do you read?

04 04 32 40 CMP (COLUMBIA)

I read you loud and clear, Houston. How me?

04 04 32 43 CC

Roger, Mike. Five by. On my Mark 7 minutes to ignition.

04 04 32 49 CC

MARK.

04 04 32 50 CC

Seven minutes.

04 04 32 55 CMP (COLUMBIA)

I agree. Everything's looking real good.

04 04 33 47 CC

Apollo 11, Houston. You are looking good for separation. You are GO for separation, Columbia. Over.

04 04 33 55 CMP (COLUMBIA)

Columbia understands.

04 04 34 38 CMP (COLUMBIA)

We're really stabilized, Neil. I haven't burned a thruster in 5 minutes.

04 04 35 26 CMP (COLUMBIA)

I'll make a small trim maneuver.

04 04 36 21 CDR (EAGLE)

Mike, what's going to be your pitch angle at SEP?

04 04 36 27 CMP (COLUMBIA)

007 degrees.

04 04 36 28 CDR (EAGLE)

Okay.

04 04 36 44 CMP (COLUMBIA)

Is that close enough for you or do you want it to a couple of decimal places?

04 04 36 46 CDR (EAGLE)

No. That's good.

04 04 37 31 CMP (COLUMBIA)

I think you've got a fine looking flying machine there, Eagle, despite the fact you're upside down.

04 04 37 36 CDR (EAGLE)

Somebody's upside-down.

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04 04 38 53 CMP (COLUMBIA)

Okay, Eagle. One minute until TIG. You guys take care.

04 04 38 56 CDR (EAGLE)

See you later.

04 04 40 19 CMP (COLUMBIA)

Houston, Columbia. My DSKY is reading 4.9, in X, 5.0 ..., make it and EMS 105.4. Over.

04 04 40 32 CC

Roger. Copy. Columbia, it looks good to us. Over.

04 04 40 36 CMP (COLUMBIA)

Thanks.

04 04 41 07 CC

Columbia, Houston. We'd like you to terminate average G. Over.

04 04 41 16 CMP (COLUMBIA)

Roger. In P00.

04 04 43 00 CDR (EAGLE)

You're going right down U.S. 1, Mike.

04 04 47 20 CMP (COLUMBIA)

Eagle, Columbia. At your convenience, I would like to switch over to VHF ranging modes.

04 04 47 29 LMP (EAGLE)

Roger. Let's go to VHF ranging now.

04 04 47 31 CMP (COLUMBIA)

Okay.

04 04 47 32 CMP (COLUMBIA)

MARK.

04 04 47 58 CMP (COLUMBIA)

Eagle, Columbia. I am reading you loud and scratchy. Neil is not coming through too well on his VOX. Could you be quiet for 15 seconds while I get this locked on.

04 04 48 13 LMP (EAGLE)

Okay.

04 04 48 33 CMP (COLUMBIA)

I've got a solid lock on. I have you at 0.27 miles.

04 04 49 07 CC

Eagle, Houston. We've got a state vector for you. We'd like P00 and DATA. Over.

04 04 49 15 LMP (EAGLE)

You have it.

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04 04 49 16 CC

Thank you, sir.

04 04 49 29 CC

Columbia, Houston. We have a CSM rescue PAD if you are ready to copy. Over.

04 04 49 37 CMP (COLUMBIA)

Ready to copy.

04 04 49 39 CC

Roger, Mike. Phasing TIG 103 40 0000, TPI for PDI less than 10, 105 12 3000, TPI for PDI greater than 10, 107 11 3000. Over.

04 04 50 14 CMP (COLUMBIA)

Roger. TIG's follow: phasing 103 40, PDI less than 10, 105 12 30 more than 10, 107 11 30. Over.

04 04 50 25 CC

Good readback. Out.

04 04 50 57 CC

Eagle, Houston. When you are ready to copy, I have a lunar surface data PAD for you. Over.

04 04 51 08 LMP (EAGLE)

Roger. Stand by.

04 04 51 10 CC

We've got the load in, Eagle. You can go back updata link OFF. Over.

04 04 51 21 LMP (EAGLE)

Roger.

04 04 52 16 CC

Columbia, Houston. At your convenience we'd like P00 and ACCEPT. We have a couple of state vectors for you. Over.

04 04 52 24 CMP (COLUMBIA)

Okay. Going to P00 and ACCEPT, and I just got some unexplained roll thruster activity. I might have bumped the hand controller.

04 04 52 32 CC

Roger. We will look at it. Out

04 04 52 38 LMP (EAGLE)

And Eagle is ready to copy lunar surface data PAD.

04 04 52 43 CC

Roger, Buzz. Starting with the T2, T2 TIG: 102 54 2900 103 51 5600 106 37 3500 109 10 0000. In the remarks: T2 occurs at PDI plus 2126. T3 time - correction T3, T3 TIG: 104 39 4100 001 58 1500 001 58 5400. NOUN 11: 105 36 2300 107 11 3000. Ready for your readback. Over.

04 04 54 20 LMP (EAGLE)

Roger. T2: 102 54 2900 103 51 5600 106 37 3500

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109 10 0000, T2 is PDI plus 2126. T3: 104 39 4100 001 58 1500 001 58 5400 105 36 2300 107 11 3000. Over.

04 04 55 10 CC

Roger. Good readback, Eagle. Out.

04 04 55 50 CMP (COLUMBIA)

Would you put your tracking light on, please?

04 04 55 53 LMP (EAGLE)

It's on, Mike.

04 04 55 54 CMP (COLUMBIA)

Thank you.

04 04 56 20 CC

Columbia, Houston. We've got the load in. You can go back to BLOCK. Over.

04 04 56 30 CMP (COLUMBIA)

Is that for Columbia?

04 04 56 32 CC

That's affirmative, Columbia.

04 04 56 37 CMP (COLUMBIA)

Okay. Thank you, Houston.

04 04 58 31 LMP (EAGLE)

Mike, you want to give us a Mark when you're right at 7 miles - I mean seven tenths of a mile?

04 04 58 36 CMP (COLUMBIA)

Will do.

04 04 58 57 LMP (EAGLE)

Okay. We just got seven tenths on the radar.

04 04 58 59 CMP (COLUMBIA)

MARK.

04 04 59 00 CMP (COLUMBIA)

Yes. I'm oscillating between 0.69 and seven tenths.

04 04 59 05 LMP (EAGLE)

Very good. We've got 4200 on the ... meter.

04 04 59 11 CMP (COLUMBIA)

I'm steady on 70 now. Yes. I read you sort of scratchy, but I read you.

04 05 00 01 CMP (COLUMBIA)

Houston, Apollo - or Houston, Columbia. Over.

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04 05 00 04 CC

Roger. Go, Columbia. Over.

04 05 00 08 CMP (COLUMBIA)

Roger. I still need a DOI P76 PAD, and a PDI 1 plus 12 P76 PAD sometime at your convenience.

04 05 00 16 CC

Roger. Stand by.

04 05 01 05 CC

Columbia, Houston. DOI P76 PAD, if you're ready to copy. Over.

04 05 01 13 CMP (COLUMBIA)

Ready to copy.

04 05 01 14 CC

Roger, Mike. NOUN 80 - correction, NOUN 84: minus 00758, plus all zeros, plus 00098; NOUN 33: 101 36 1400, and stand by for the PDI plus 12.

04 05 01 43 CMP (COLUMBIA)

Roger.

04 05 01 47 CC

Columbia, Houston, with the PDI plus 12 NOUN 84, if you're ready to copy.

04 05 01 54 CMP (COLUMBIA)

Ready to copy.

04 05 01 56 CC

Roger. NOUN 84: plus 01223, minus all zeros, plus 01889; NOUN 33: 102 44 2700, PDI plus 12 burn time is 046, burn time for DOI is 030. Ready for your readback. Over.

04 05 02 40 CMP (COLUMBIA)

Roger. DOI P76: 84 is minus 00758, all balls, plus 00098, aL 101 36 1400; plus 01223, minus all balls, plus 01889, 102 44 2700; burn time 46 and 30 seconds.

04 05 03 09 CC

Roger. One error, Columbia, on the TIG for DOI; seconds was 1407. Over.

04 05 03 21 CMP (COLUMBIA)

Roger. 1407.

04 05 03 23 CC

Roger.

04 05 03 37 CC

Columbia, Houston. We'd like you to turn off your rotational direct - rotational control power direct number 2 off. Over.

04 05 03 49 CMP (COLUMBIA)

It's off. Thank you.

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04 05 06 58 CC

Columbia, Houston. On those P76's, a friendly reminder from your FIDO: add half the burn time to the TIG. Over.

04 05 07 10 CMP (COLUMBIA)

Roger.

04 05 14 09 CC

Columbia, Houston. We've lost data with Eagle. Will you please have him select aft OMNI? Over.

04 05 14 22 CMP (COLUMBIA)

Eagle, this is Columbia. Houston would like you to select aft OMNI.

04 05 14 37 LMP (EAGLE)

Roger. I got it now. Houston, you reading Eagle now on aft OMNI?

04 05 14 41 CC

That's affirmative, Eagle. Reading you five by.

04 05 14 58 CMP (COLUMBIA)

Roger.

04 05 16 17 CC

Columbia, Houston. We'll have LOS at 101 28. AOS for you 102 15. Over.

04 05 16 30 CMP (COLUMBIA)

Thank you.

04 05 17 07 CC

Eagle, Houston. It appeared to us when you were doing the P52, maneuvering the S band, the high gain went into the stop. Verify that both S band breakers are in. Over.

04 05 17 23 LMP (EAGLE)

Roger. I think I'd gone up to 90.0 before it went there. The one on this side is in and I'll check the other later.

04 05 17 29 CC
Okay. Thank you, Buzz.

04 05 17 53 CC
Eagle, Houston. You are GO for DOI. Over.

04 05 18 00 LMP (EAGLE)
Roger. GO for DOI. Do you have LOS and AOS times?

04 05 18 03 CC
Roger. For you LOS at 101 28. AOS 102 16. Over.

04 05 18 16 LMP (EAGLE)
Roger. Copy.

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04 05 18 18 CC
And, Buzz, S band steerable update for you on the angles at AOS: 219 and yaw 30. Over.

04 05 18 31 LMP (EAGLE)
Roger. That's in the flight plan. Thank you.

04 05 19 08 CMP (COLUMBIA)
Houston, Columbia. How are all the systems looking?

04 05 19 13 CC
Say again, Over.

04 05 19 19 CMP (COLUMBIA)
Just wanted to get a systems check from you sometime prior to LOS.

04 05 19 23 CC
Roger.

04 05 19 46 CDR (EAGLE)
Houston, Eagle. You can - Torquing angles NOUN 93 on four zeros and a 3 are minus 00292, plus 00289, minus 00094.

04 05 20 04 CC
Roger. Copy. Stand by. Roger, Eagle. You can torque it. Over.

04 05 20 18 CDR (EAGLE)
Roger. Copy.

04 05 20 44 CC
Columbia, Houston. Your systems are looking good going over the hill. Approximately 7 minutes to LOS.

04 05 20 53 CMP (COLUMBIA)
Thank you.

04 05 22 37 CC
Eagle, Houston. Place the BIOMED to Commander. Over.

04 05 22 48 LMP (EAGLE)
Roger. You got him.

04 05 22 51 CC
Thank you, sir.

04 05 23 43 CC

Eagle, Houston. We've lost the high bit rate. Would you please select low bit rate? Over.

04 05 23 52 LMP (EAGLE)

You got it.

04 05 23 54 CC

And, Eagle, on my Mark we'll have 12 minutes to ignition. Over.

04 05 24 06 LMP (EAGLE)

Roger.

Tape 65/9 Page 305

04 05 24 08 CC

Eagle, Houston. Stand by for my Mark.

04 05 24 13 CC

MARK.

04 05 24 14 CC

Twelve minutes to ignition.

04 05 24 18 LMP (EAGLE)

We copy.

04 05 25 27 CC

Columbia/Eagle, Houston. Three minutes to LOS. Both looking good going over the hill.

04 05 25 34 CMP (COLUMBIA)

Columbia. Roger.

04 05 25 38 LMP (EAGLE)

Eagle. Roger,

END OF TAPE

Tape 66/1 Page 306

04 05 51 -- BEGIN LUNAR REV 14

04 06 15 02 CC

Columbia, Houston. We're standing by. Over.

04 06 15 36 CC

Columbia, Houston. Over.

04 06 15 41 CMP (COLUMBIA)

Houston, Columbia. Reading you loud and clear. How me?

04 06 15 43 CC

Roger. Five by, Mike. How did it go? Over.

04 06 15 49 CMP (COLUMBIA)

Listen, babe. Everything's going just swimmingly, Beautiful.

04 06 15 52 CC

Great. We're standing by for Eagle.

04 06 15 57 CMP (COLUMBIA)

Okay, He's coming along.

04 06 16 00 CC

We copy. Out.

04 06 16 09 CC

And, Columbia, Houston. We expect to lose your high gain sometime during the powered descent. Over.

04 06 16 19 CMP (COLUMBIA)

Columbia. Roger. You don't much care do you?

04 06 16 22 CC

No, sir.

04 06 17 27 LMP (EAGLE)

Houston, Eagle. How do you read?

04 06 17 29 CC

Five by, Eagle. We're standing by for your burn report. Over.

04 06 17 36 LMP (EAGLE)

Roger. The burn was on time. The residuals before nulling: minus 0.1, minus 0.4, minus 0.1, X and Z nulled to zero ... nulling ...

04 06 18 25 CC

Columbia, Houston. We've lost all data with Eagle. Please have him reacquire on the high gain, Over.

04 06 18 37 CMP (COLUMBIA)

Eagle, this is Columbia. Houston would like you to reacquire on the high gain. They've lost your data. Over.

04 06 18 50 CMP (COLUMBIA)

Eagle, did you copy Columbia?

04 06 18 54 CC

Eagle, Houston. Did you call?

Tape 66/2 Page 307

04 06 19 05 LMP (EAGLE)

Eagle, Houston - Houston, Eagle. How do you read now?

04 06 19 08 CC

Roger. Five by, Neil. We copied up to the AGS residuals. Would you please repeat the AGS residuals in the trim - correction - the Sun check? Over.

04 06 19 19 LMP (EAGLE)

Roger. AGS residuals: minus 0.1, minus 0.2, minus 0.7. And we used the PGNS NOUN 86 for DELTA-VZ which was 9.5, versus yours which was 9.1, and I believe that may explain the difference. Apogee 57.2, perilune 9.1, Sun check to three marks, NOUN 20, minus NOUN 22, plus 0.19, plus 0.16, plus 0.11. Over.

04 06 19 54 CC

Roger. Copy. Looks great.

04 06 22 37 CC

Columbia, Houston. We've lost Eagle again. Have him try the high gain. Over.

04 06 22 46 CMP (COLUMBIA)

Eagle, this is Columbia. Houston lost you again. They're requesting another try at the high gain.

04 06 23 57 CC

Eagle, Houston. We have you now. Do you read? Over.

04 06 24 02 LMP (EAGLE)

Loud and clear.

04 06 24 04 CC

Roger. We see your VERB 47.

04 06 24 12 LMP (EAGLE)

Yes. I don't know what the problem was there. It just started oscillating around in yaw. According to the needle, we're picking up a little oscillation right now, as a matter of fact.

04 06 24 23 CC

Roger. We'll work on it.

04 06 24 38 CDR (EAGLE)

Horizon checklist right on time.

04 06 24 41 CC

Roger.

04 06 24 45 LMP (EAGLE)

Did you copy the star - I mean the Sun check, Charlie?

04 06 24 48 CC

That's affirmative. We did, Buzz. Out.

04 06 25 35 CC

Eagle, Houston. The AGS initialization looked good to us. Over.

04 06 25 43 LMP (EAGLE)

Roger.

Tape 66/3 Page 308

04 06 26 28 CDR (EAGLE)

Our radar checks indicate 50,000 foot perilune. Our visual altitude checks steadying out at about 53,000.

04 06 26 37 CC

Roger. Copy.

04 06 26 55 LMP (EAGLE)

And, Houston, we got a 500 alarm early in the program. Went to DESCENT 1, proceeded on it, and we're back at AUTO again. Over.

04 06 27 06 CC

Roger. We saw that, Buzz. Thank you much. Out.

04 06 27 09 LMP (EAGLE)

All right. I say again - Okay. That wasn't an alarm; that was a code. Okay.

04 06 27 14 CC

Roger. We saw that.

04 06 27 22 CC

Eagle, Houston. We recommend you yaw 10 right. It will help us on the high gain signal strength. Over.

04 06 28 08 CC

Eagle, Houston. If you read, you're GO for powered descent. Over.

04 06 28 18 CMP (COLUMBIA)

Eagle, this is Columbia. They just gave you a GO for powered descent.

04 06 28 22 CC

Columbia, Houston. We've lost them on the high gain again. Would you please - We recommend they yaw right 10 degrees and reacquire.

04 06 28 34 CMP (COLUMBIA)

Eagle, this is Columbia. You're GO for PDI and they recommend you yaw right 10 degrees and try the high gain again.

04 06 28 46 CMP (COLUMBIA)

Eagle, you read Columbia?

04 06 28 48 LMP (EAGLE)

Roger. We read you.

04 06 28 49 CMP (COLUMBIA)

Okay.

04 06 28 51 CC

Eagle, Houston. We read you now. You're GO for PDI. Over.

04 06 28 57 LMP (EAGLE)

Roger. Understand. AELD control circuit breakers. DECA GIMBAL AC - closed?

04 06 29 07 CDR (EAGLE)

What?

Tape 66/4 Page 309

04 06 29 08 LMP (EAGLE)

DECA GIMBAL AC - closed? Circuit breaker? COMMAND OVERRIDE - off? GIMBAL ENABLE? RATE SCALE - 25.

04 06 29 23 CC

Eagle, Houston. Your alignment is GO on the AGS. On my Mark, 3 30 until ignition.

04 06 29 29 LMP (EAGLE)

Roger.

04 06 29 33 CC

Mark.

04 06 29 34 CC

3 30 until ignition.

04 06 29 38 LMP (EAGLE)

Roger. Copy. Thrust translation - four jets - Balance couple - ON. TTCA throttle - MINIMUM. Throttle - AUTO CDR. Prop button - RESET. Prop button. Okay. ABORT/ABORT STAGE - RESET. ATT CONTROL - three of them to MODE CONTROL. Okay, MODE CONTROL is set. AGS is reading 400 plus 1. Standing by for ...

04 06 30 45 LMP (EAGLE)

Hit VERB 77?

04 06 31 04 LMP (EAGLE)

Okay. Sequence camera coming on.

04 06 31 32 CC

Eagle, Houston. If you'd like to try high gain, pitch 212, yaw 37. Over.

04 06 31 45 LMP (EAGLE)

Roger. I think I've got you on high gain now.

04 06 31 49 CC

Roger.

04 06 32 03 LMP (EAGLE)

Say again the angles, though.

04 06 32 05 CC

Roger.

04 06 32 06 LMP (EAGLE)

I'll set them in to use them before we yaw around.

04 06 32 08 CC

Roger. Pitch 212, yaw plus 37.

04 06 32 24 LMP (EAGLE)

OMNI's in.

04 06 33 09 LMP (EAGLE)

... 10 ... 10 percent ...

Tape 66/5 Page 310

04 06 33 41 CC

Columbia, Houston. We've lost them. Tell them to go aft OMNI. Over.

04 06 33 51 CMP (COLUMBIA)

They've lost you. Use the OMNI's again.

04 06 34 01 LMP (EAGLE)

...

04 06 34 05 CMP (COLUMBIA)

Say again, Neil?

04 06 34 07 LMP (EAGLE)

I'll leave it in SLEW. Relay to us. See if they have got me now. I've got good signal strength in SLEW.

04 06 34 13 CMP (COLUMBIA)

Okay. You should have him now, Houston.

04 06 34 16 CC

Eagle, we've got you now. It's looking good. Over.

04 06 34 23 CC

Eagle - -

04 06 34 24 LMP (EAGLE)

- - descent looks good.

04 06 34 25 CC

Eagle, Houston. Everything is looking good here. Over.

04 06 34 29 LMP (EAGLE)

Roger. Copy.

04 06 34 34 CC

Eagle, Houston. After yaw around, angles: S band pitch, minus 9, yaw plus 18.

04 06 34 46 LMP (EAGLE)

Copy.

04 06 34 59 LMP (EAGLE)

AGS and PNGS agree very closely.

04 06 35 01 CC

Roger.

04 06 35 14 LMP (EAGLE)

Beta ARM. Altitudes are a little high.

04 06 35 45 LMP (EAGLE)

Houston. I'm getting a little fluctuation in the AC voltage now.

04 06 35 51 CC

Roger.

04 06 35 52 LMP (EAGLE)

Could be our meter, maybe, huh?

Tape 66/6 Page 311

04 06 35 54 LMP (EAGLE)

Stand by, Looking good to us. You're still looking good at 3, coming up 3 minutes.

04 06 36 13 LMP (EAGLE)

... real good ... about on.

04 06 36 18 CDR (EAGLE)

Our. position checks downrange show us to be a little long.

04 06 36 21 CC

Roger. Copy.

04 06 36 24 LMP (EAGLE)

AGS has gone about 2 feet per second greater ...

04 06 36 36 CDR (EAGLE)

... ought to be ... Stand by,

04 06 36 43 LMP (EAGLE)

Altitude ...

04 06 37 00 LMP (EAGLE)

... it's going to stop.

04 06 37 18 CC

Eagle, Houston. You are GO to continue - -

04 06 37 19 LMP (EAGLE)

... closed ... GO ... at 4 minutes.

04 06 37 22 CC

Roger. You are GO - You are GO to continue powered descent. You are GO to continue powered descent.

04 06 37 30 LMP (EAGLE)

Roger.

04 06 37 35 CC

And, Eagle, Houston. We've got data dropout. You're still looking good.

04 06 38 04 LMP (EAGLE)

... PGNS. We got good lock-on. Altitude lights OUT. DELTA-H is minus 2 900.

04 06 38 18 CC

Roger. We copy.

04 06 38 20 LMP (EAGLE)

Got the Earth right out our front window.

04 06 38 23 CDR (EAGLE)

Houston, you're looking at our DELTA-H?

04 06 38 25 CC

That's affirmative.

04 06 38 26 CDR (EAGLE)

PROGRAM ALARM.

Tape 66/7 Page 312

04 06 38 28 CC

It's looking good to us. Over.

04 06 38 30 CDR (EAGLE)

It's a 1202.

04 06 38 32 LMP (EAGLE)

1202.

04 06 38 48 CDR (EAGLE)

Give us a reading on the 1202 PROGRAM ALARM.

04 06 38 53 CC

Roger. We got - We're GO on that alarm

04 06 38 59 CDR (EAGLE)

Roger. P30.

04 06 39 01 CC

6 plus 25, throttle down - -

04 06 39 02 LMP (EAGLE)

Looks like about 820 -

04 06 39 03 CC

- - 6 plus 25, throttle down.

04 06 39 06 CDR (EAGLE)

Roger. Copy. 6 plus 25.

04 06 39 14 LMP (EAGLE)

Same alarm, and it appears to come up when we have a 1668 up.

04 06 39 17 CC

Roger. Copy.

04 06 39 23 CC

Eagle, Houston. We'll monitor your DELTA-H.

04 06 39 24 LMP (EAGLE)

... worked out beautifully.

04 06 39 28 CC

DELTA H - -

04 06 39 29 LMP (EAGLE)

... looks good now.

04 06 39 30 CC

Roger. DELTA H is looking good to us.

04 06 39 34 LMP (EAGLE)

Ah! Throttle down - -

04 06 39 35 CDR (EAGLE)

Throttle down on time!

04 06 39 36 CC
Roger, We copy throttle down - -

Tape 66/8 Page 313

04 06 39 37 LMP (EAGLE)
- - ... throttles down. Better than the simulator.

04 06 39 42 CC
Roger.

04 06 39 48 LMP (EAGLE)
AGS and PGNS look real close.

04 06 40 08 CC
At 7 minutes, you're looking great to us, Eagle.

04 06 40 13 LMP (EAGLE)
Okay. I'm still on SLEW so we may tend to lose as we gradually pitch over. Let me try AUTO again now and see what happens.

04 06 40 21 CC
Roger.

04 06 40 23 LMP (EAGLE)
Okay. Looks like it's holding.

04 06 40 24 CC
Roger. We got good data.

04 06 40 49 CC
Eagle, Houston. It's descent 2 fuel to MONITOR. Over.

04 06 40 55 CDR (EAGLE)
Going to 2.

04 06 41 01 LMP (EAGLE)
Give us an estimated switchover time please, Houston.

04 06 41 05 CC
Roger. Stand by. You're looking great at 8 minutes.

04 06 41 10 LMP (EAGLE)
At 7000 -

04 06 41 12 CC
Eagle, you've got 30 seconds to P64.

04 06 41 15 LMP (EAGLE)
... Roger.

04 06 41 27 CC
Eagle, Houston. Coming up 8 30; you're looking great.

04 06 41 35 LMP (EAGLE)
P64.

04 06 41 37 CC
We copy.

04 06 41 51 CC

Eagle, you're looking great. Coming up 9 minutes.

Tape 66/9 Page 314

04 06 42 05 CDR (EAGLE)

Manual attitude control is good.

04 06 42 08 CC

Roger. Copy.

04 06 42 10 CC

Eagle, Houston. You're GO for landing. Over.

04 06 42 17 LMP (EAGLE)

Roger. Understand. GO for landing. 3000 feet. PROGRAM ALARM.

04 06 42 19 CC

Copy.

04 06 42 22 LMP (EAGLE)

1201

04 06 42 24 CDR (EAGLE)

1201.

04 06 42 25 CC

Roger. 1201 alarm. We're GO. Same type. We're GO.

04 06 42 31 LMP (EAGLE)

2000 feet. 2000 feet. Into the AGS, 47 degrees.

04 06 42 35 CC

Roger.

04 06 42 36 LMP (EAGLE)

47 degrees.

04 06 42 41 CC

Eagle, looking great. You're GO.

04 06 42 58 CC

Roger. 1202. We copy it.

04 06 43 01 LMP (EAGLE)

35 degrees. 35 degrees. 750. Coming down to 23.

04 06 43 07 LMP (EAGLE)

700 feet, 21 down, 33 degrees.

04 06 43 11 LMP (EAGLE)

600 feet, down at 19.

04 06 43 15 LMP (EAGLE)

540 feet, down at - 30. Down at 15.

04 06 43 26 LMP (EAGLE)

At 400 feet, down at 9.

04 06 43 29 LMP (EAGLE)
... forward.

Tape 66/10 Page 315

04 06 43 32 LMP (EAGLE)
350 feet, down at 4.

04 06 43 35 LMP (EAGLE)
30, ... one-half down.

04 06 43 42 LMP (EAGLE)
We're pegged on horizontal velocity.

04 06 43 46 LMP (EAGLE)
300 feet, down 3 1/2, 47 forward.

04 06 43 51 LMP (EAGLE)
... up.

04 06 43 52 LMP (EAGLE)
On 1 a minute, 1 1/2 down.

04 06 43 57 CDR (EAGLE)
70.

04 06 44 04 LMP (EAGLE)
Watch your shadow out there.

04 06 44 07 LMP (EAGLE)
50, down at 2 1/2, 19 forward.

04 06 44 13 LMP (EAGLE)
Altitude-velocity light.

04 06 44 16 LMP (EAGLE)
3 1/2 down, 220 feet, 13 forward.

04 06 44 23 LMP (EAGLE)
11 forward. Coming down nicely.

04 06 44 24 LMP (EAGLE)
200 feet, 4 1/2 down.

04 06 44 26 LMP (EAGLE)
5 1/2 down.

04 06 44 31 LMP (EAGLE)
160, 6 - 6 1/2 down.

04 06 44 33 LMP (EAGLE)
5 1/2 down, 9 forward. That's good.

04 06 44 40 LMP (EAGLE)
120 feet.

Tape 66/11 Page 316

04 06 44 45 LMP (EAGLE)

100 feet, 3 1/2 down, 9 forward. Five percent.

04 06 44 51 LMP (EAGLE)

...

04 06 44 54 LMP (EAGLE)

Okay. 75 feet. There's looking good. Down a half, 6 forward.

04 06 45 02 CC

60 seconds.

04 06 45 04 LMP (EAGLE)

Lights on. ...

04 06 45 08 LMP (EAGLE)

Down 2 1/2. Forward. Forward. Good.

04 06 45 17 LMP (EAGLE)

40 feet, down 2 1/2. Kicking up some dust.

04 06 45 21 LMP (EAGLE)

30 feet, 2 1/2 down. Faint shadow.

04 06 45 25 LMP (EAGLE)

4 forward. 4 forward. Drifting to the right a little. Okay. Down a half.

04 06 45 31 CC

30 seconds.

04 06 45 32 CDR (EAGLE)

Forward drift?

04 06 45 33 LMP (EAGLE)

Yes.

04 06 45 34 LMP (EAGLE)

Okay.

04 06 45 40 LMP (EAGLE)

CONTACT LIGHT.

04 06 45 43 LMP (EAGLE)

Okay. ENGINE STOP.

04 06 45 45 LMP (EAGLE)

ACA - out of DETENT.

04 06 45 46 CDR (EAGLE)

Out of DETENT.

04 06 45 47 LMP (EAGLE)

MODE CONTROL - both AUTO. DESCENT ENGINE COMMAND OVERRIDE - OFF. ENGINE ARM - OFF.

Tape 66/12 Page 317

04 06 45 52 LMP (EAGLE)
413 is in.

04 06 45 57 CC
We copy you down, Eagle.

04 06 45 59 CDR (TRANQ)
Houston, Tranquility Base here.

04 06 46 04 CDR (TRANQ)
THE EAGLE HAS LANDED.

04 06 46 06 CC
Roger, Tranquility. We copy you on the ground. You got a bunch of guys about to turn blue. We're breathing again. Thanks a lot.

04 06 46 16 CDR (TRANQ)
Thank you.

04 06 46 18 CC
You're looking good here.

04 06 46 23 CDR (TRANQ)
Okay. We're going to be busy for a minute.

04 06 46 25 LMP (TRANQ)
MASTER ARM, ON. Take care of the ... I'll get this ...

04 06 46 38 LMP (TRANQ)
Very smooth touchdown.

04 06 46 52 LMP (TRANQ)
...

04 06 47 03 LMP (TRANQ)
Okay. It looks like we're venting the oxidizer now.

04 06 47 06 CC
Roger, Eagle. And you are STAY for - -

04 06 47 08 LMP (TRANQ)
...

04 06 47 09 CC
- - T1. Over. Eagle, you are STAY for T1.

04 06 47 12 CDR (TRANQ)
Roger. Understand, STAY for T1.

04 06 47 15 CC
Roger. And we see you venting the 0X.

04 06 47 20 LMP (TRANQ)
Roger.

Tape 66/13 Page 318

04 06 47 37 LMP (TRANQ)

... circuit breaker.

04 06 48 10 LMP (TRANQ)

... copy NOUN 60, NOUN 43. Over.

04 06 48 13 CC

Roger. We have it.

04 06 48 14 CMP (COLUMBIA)

Houston, how do you read Columbia on the high gain?

04 06 48 17 CC

Roger - -

04 06 48 18 LMP (TRANQ)

...

04 06 48 19 CC

- - We read you five by, Columbia. He has landed, Tranquility Base. Eagle is at Tranquility. Over.

04 06 48 26 CDR (TRANQ)

Yes. I heard the whole thing.

04 06 48 27 CC

... good show.

04 06 48 31 CMP (COLUMBIA)

Fantastic.

04 06 48 32 LMP (TRANQ)

Engine STOP RESET.

04 06 48 58 CMP (COLUMBIA)

Houston, Columbia went UPTHEMETRY COMMAND, RESET, to reacquire on the high gain.

04 06 49 02 CC

Copy. Out.

04 06 49 39 CC

Eagle, Houston. You loaded R2 wrong. We want 10254.

04 06 49 50 LMP (TRANQ)

Roger.

04 06 50 28 LMP (TRANQ)

And do you want V horizontal 5515.2?

04 06 50 32 CC

That's affirmative.

04 06 50 59 LMP (TRANQ)

Like - AGS to PGNS align.

04 06 51 04 CC

Say again?

Tape 66/14 Page 319

04 06 51 07 LMP (TRANQ)

Like an AGS to PNGS align. Over.

04 06 51 11 CC

Roger. We're standing by for it.

04 06 51 41 LMP (TRANQ)

... quantity ...

04 06 51 45 CC

Eagle, Houston. You are STAY for T2. Over.

04 06 51 50 CC

Correction, you're - -

04 06 51 52 CDR (TRANQ)

Roger. STAY for T2. We thank you.

04 06 51 54 CC

Roger, sir.

04 06 53 37 CC

Tranquility Base, Houston. We recommend you exit P12. Over.

04 06 55 16 CDR (TRANQ)

Hey, Houston, that may have seemed like a very long final phase. The AUTO targeting was taking us right into a football field size - football field sized crater, with a large number of big boulders and rocks for about ... one or two crater diameters around it, and it required a ... in P66 and flying manually over the rock field to find a reasonably good area.

04 06 55 49 CC

Roger. We copy. It was beautiful from here, Tranquility. Over.

04 06 56 02 LMP (TRANQ)

We'll get to the details of what's around here, but it looks like a collection of just about every variety of shape, angularity, granularity, about every variety of rock you could find. The colors - Well, it varies pretty much depending on how you're looking relative to the zero phase point. There doesn't appear to be too much of a general color at all. However, it looks as though some of the rocks and boulders, of which there are quite a few in the near area, it looks as though they're going to have some interesting colors to them. Over.

04 06 56 47 CC

Roger. Copy. Sounds good to us, Tranquility. We'll let you press on through the simulated countdown, and we'll talk to you later. Over.

04 06 57 00 CDR (TRANQ)

Roger.

Tape 66/15 Page 320

04 06 57 02 LMP (TRANQ)

Okay. This one sixth g is just like the airplane.

04 06 57 04 CC

Roger. Tranquility. Be advised there's lots of smiling faces in this room and all over the world. Over.

04 06 57 15 CDR (TRANQ)

Well, there are two of them up here.

04 06 57 17 CC

Roger. That was a beautiful job, you guys.

04 06 57 19 CMP (COLUMBIA)

And don't forget one in the command module.

04 06 57 22 CC

Roger.

04 06 57 48 CC

Tranquility, Houston. We have you pitched up about 4 1/2 degrees. Over.

04 06 57 55 CDR (TRANQ)

That's confirmed by our local observation.

04 06 58 00 CC

Roger.

02 06 58 12 CMP (COLUMBIA)

And thanks for putting me on relay, Houston. I was missing all the action.

04 06 58 16 CC

Roger. We'll enable MSFN relay.

04 06 58 27 CMP (COLUMBIA)

I just got it, I think.

04 06 58 28 CC

Roger, Columbia. This is Houston. Say something. They ought to be able to hear you. Over.

04 06 58 40 CMP (COLUMBIA)

Roger, Tranquility Base. It sure sounded great from up here. You guys did a fantastic job.

04 06 58 48 CDR (TRANQ)

Thank you. Just keep that orbiting base ready for us up there now.

04 06 58 55 CMP (COLUMBIA)

Will do.

04 06 59 19 CC

Columbia, Houston. LOS 103 27, AOS 104 13. Over.

04 06 59 32 CMP (COLUMBIA)

Thank you.

Tape 66/16 Page 321

04 07 00 42 CC

Tranquility Base, Houston. All your consumables are solid. You're looking good in every respect. We copy the DPS are venting. Everything is copasetic. Over.

04 07 00 58 CDR (TRANQ)

Thank you, Houston.

04 07 02 03 CDR (TRANQ)

Houston, the guys that said that we wouldn't be able to tell precisely where we are are the winners today. We were a little busy worrying about program alarms and things like that in the part of the descent where we would normally be picking out our landing spot; and aside from a good look at several of the craters we came over in the final descent, I haven't been able to pick out the things on the horizon as a reference as yet.

04 07 02 41 CC

Roger, Tranquility. No sweat. We'll figure out - We'll figure it out. Over.

04 07 03 32 CDR (TRANQ)

You might be interested to know that I don't think we notice any difficulty at all in adapting to one sixth g. It seems immediately natural to move in this environment.

04 07 03 47 CC

Roger, Tranquility. We copy. Over.

04 07 03 55 CDR (TRANQ)

The area out the left hand window is a relatively level plain cratered with a fairly large number of craters of the 5 to 50 foot variety, and some ridges - small, 20, 30 feet high, I would guess, and literally thousands of little 1 and 2 foot craters around the area. We see some angular blocks out several hundred feet in front of us that are probably 2 feet in size and have angular edges. There is a hill in view, just about on the ground track ahead of us. Difficult to estimate, but might be a half a mile or a mile.

04 07 04 54 CC

Roger, Tranquility. We copy Over.

04 07 05 01 CMP (COLUMBIA)

Sounds like it looks a lot better than it did yesterday - -

04 07 05 02 CDR (TRANQ)

...

Tape 66/17 Page 322

04 07 05 03 CMP (COLUMBIA)

-- at that very low Sun angle. It looked rough as a cob then.

04 07 05 11 CDR (TRANQ)

It really was rough, Mike. Over the targeted landing area, it was extremely rough, cratered, and large numbers of rocks that were probably some, many larger than 5 or 10 feet in size.

04 07 05 32 CMP (COLUMBIA)

When in doubt, land long.

04 07 05 38 CDR (TRANQ)

So we did.

04 07 05 57 CC

Tranquility, Houston. After you get through this P57, we'd like an E memory dump. Over.

04 07 06 07 LMP (TRANQ)

Roger. After this first P57, you want an E memory dump.

04 07 06 11 CC

That's affirmative.

04 07 06 16 CC

Columbia, Houston. We have a P22 update for you, if you're ready to copy. Over.

04 07 06 27 CMP (COLUMBIA)

At your service, sir.

04 07 06 29 CC

Roger, Mike. T1, 104 32 18; T2, 104 37 28. And that is 4 miles south. This is based on a targeted landing site. Over.

04 07 06 58 CMP (COLUMBIA)

Okay. Roger. Understand based on a targeted landing site; T1, 104 32 18; T2, 104 37 28, and 4 miles south.

04 07 07 10 CC

Roger.

04 07 07 13 CMP (COLUMBIA)

Do you have any idea whether they landed left or right of center line? Just a little bit long, is that all we know?

04 07 07 19 CC

Apparently that's about all we can tell. Over.

04 07 07 24 CMP (COLUMBIA)

Okay. Thank you.

04 07 08 06 CC

Tranquility, Houston - -

04 07 08 07 CDR (TRANQ)

And, Houston, our mission timer is now reading 902 34 47 and static.

Tape 66/18 Page 323

04 07 08 17 CC

Roger. Copy your mission timer's now static. It - Say again the time?

04 07 08 24 CDR (TRANQ)

902 34 47.

04 07 08 35 CC

Roger. Copy, Tranquility. That gravity align looked good to us. We see you recycling.

04 07 08 47 LMP (TRANQ)

Well, no. I was trying to get time, 16 65 out, and somehow it proceeded on to the 622 before I could do a VERB 32 ENTER. I want to log a time here, and then I'd like to know whether you want me to proceed on the torquing angles or to go back and reenter again before torquing. Over.

04 07 09 08 CC

Roger, Buzz. Stand by.

04 07 10 15 CC

Tranquility, Houston. We'd like you to recall P57 and run through the gravity align one more time. Over.

04 07 10 24 LMP (TRANQ)

Roger. I concur with that.

04 07 10 26 CC

Roger, Tranquility. For the mission timer, two suggestions. Set the circuit breaker, panel 11; also reset and attempt to start. That nine in the first digit might have something to do with it. Over.

04 07 10 45 CDR (TRANQ)

Okay. We've tried both of those. If the circuit breaker is in when I reset the - put it in RESET, I get 902 04 40. When I release it now, I get 902 04 49. I'm going to cycle the circuit breaker.

04 07 11 08 CC

Roger.

04 07 11 12 CDR (TRANQ)

I cycled the circuit breaker and got all nines. And we'll not now reset from all nines.

04 07 11 22 CC

Roger.

04 07 11 37 CC

Tranquility, Houston. We'll research this problem and be back with you momentarily on the mission event time - correction, the mission timer.

Tape 66/19 Page 324

04 07 11 47 CDR (TRANQ)

Okay.

04 07 12 44 CDR (TRANQ)

I'd say the color of the - The local surface is very comparable to that we observed from orbit at this Sun angle, about 10 degrees Sun angle, or that nature. It's pretty much without color. It's gray, and it's a very white, chalky gray, as you look into the zero phase line; and it's considerably darker gray, more like a ash - ashen gray as you look out 90 degrees to the Sun. The - Some of the surface rocks in close here that have been fractured or disturbed by the rocket engine plume are coated with this light gray on the outside; but where they've been broken, they display a dark - very dark gray interior; and it looks like it could be country basalt.

04 07 14 02 CC

Roger, Tranquility. We see the NOUN 93, VERB 34.

04 07 14 10 LMP (TRANQ)

Roger. I assume you wanted it. Roger.

04 07 14 32 CC

Tranquility, Houston. Please vent fuel and OX again. Over. It's building back up.

04 07 14 42 CDR (TRANQ)

Okay. OX going now.

04 07 14 52 CC

Tranquility, Houston. You can open both fuel and OX vent now. Over.

04 07 14 59 CDR (TRANQ)

Okay.

04 07 15 01 LMP (TRANQ)

Houston, Tranquility standing by for GO on a AGS to PGNS align and a lunar align. Over.

04 07 15 09 CC

Stand by.

04 07 15 17 CC

Tranquility, Houston. You are GO for the AGS to PGNS align and a lunar align. Over.

04 07 15 26 LMP (TRANQ)

Roger.

04 07 15 44 CC

Tranquility, Houston. Please vent the fuel. It's increasing rapidly. Over.

Tape 66/20 Page 325

04 07 16 00 CDR (TRANQ)

We show 30 psi in the fuel and 30 in the oxidizer.

04 07 16 05 CC

Roger. We're reading somewhat different than that. Stand by.

04 07 16 14 CDR (TRANQ)

The fuel temperature is reading 64 in the descent, and the oxidizer - that's descent 2 - and the oxidizer is off scale low. Descent 1 is showing 61 in the fuel and 65 in the oxidizer.

04 07 16 41 CC

Roger. Stand by. Tranquility, Houston. Please take the fuel vent switch and hold it open. Over.

04 07 17 01 CDR (TRANQ)

Okay. We're holding it open. Indicating about 24 psi on board.

04 07 17 09 CC

Roger.

04 07 17 34 CDR (TRANQ)

Now indicating 20 psi in the fuel side.

04 07 17 37 CC

Roger.

04 07 17 38 CDR (TRANQ)

And 22 in the OX.

04 07 17 41 CC

Roger.

04 07 18 47 LMP (TRANQ)

Now indicating 15 psi in both tanks.

04 07 18 51 CC

Roger.

04 07 19 17 CC

Tranquility, Houston. If you haven't done so, you can release the fuel vent switch now. Over.

04 07 19 25 CDR (TRANQ)

Roger.

04 07 20 52 CC

Tranquility, Houston. We have indication that we've frozen up the descent fuel helium heat exchanger, and there's some fuel trapped in the line between there and the valves; and the pressure we're looking at is increasing there. Over.

04 07 21 10 CDR (TRANQ)

Roger. Understand.

Tape 66/21 Page 326

04 07 22 00 CC

Tranquility Base, Houston. If you have not done so, please close both fuel and OX vents now. Over.

04 07 22 17 CDR (TRANQ)

They're closed.

04 07 22 18 CC

Thank you, sir.

04 07 22 30 CDR (TRANQ)

From the surface, we could not see any stars out the window; but out my overhead hatch, I'm looking at the Earth. It's big and bright and beautiful. Buzz is going to give a try at seeing some stars through the optics.

04 07 22 54 CC

Roger, Tranquility. We understand. Must be a beautiful sight. Over.

04 07 24 52 CC

Columbia, Houston. Two minutes to LOS. You're looking great going over the hill. Over.

04 07 25 08 CMP (COLUMBIA)

Okay. Thank you. Glad to hear the system's looking good. You have a suggested attitude for me? This one here seems all right.

04 07 25 15 CC

Stand by.

04 07 25 21 CMP (COLUMBIA)

Let me know when it's lunch time, will you?

04 07 25 24 CC

Say again.

04 07 25 29 CMP (COLUMBIA)

Oh, disregard.

04 07 25 31 CC

Columbia, Houston. You got a good attitude right there.

04 07 25 37 CMP (COLUMBIA)

Okay. Thank you.

END OF TAPE

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04 07 33 16 CC

Tranquility Base, Houston. If you want me to, I can give you a hack on the mission time, every 30 minutes. Over.

04 07 34 07 CC

Tranquility, Houston. I'm counting down to T3 time. If you'd like to give me a hack, we can set up an event timer. Over.

04 07 34 22 LMP (TRANQ)

Okay. How about counting up?

04 07 34 23 CC

Roger. You want it counting up? Stand by.

04 07 35 30 CC

Tranquility, Houston. On my Mark, 62 30.

04 07 35 34 CC

MARK.

04 07 35 35 CC

62 30 from - past PDI.

04 07 35 46 LMP (TRANQ)

What we're looking for, Charlie, is the time counting up to T2 that'll be equal to 60 minutes - or T3, be equal to 60 minutes on T3.

04 07 35 56 CC

Roger. We'll have it for you.

04 07 36 28 CC

Tranquility Base, Houston. Reset the event timer to zero and on my Mark at 103 39 41. We'll give you a hack, and it'll be 1 hour. Over.

04 07 36 44 CDR (TRANQ)

Roger.

04 07 36 45 CC

And we've got about - almost 3 minutes to go, Neil. Over.

04 07 36 51 CDR (TRANQ)

Okay.

04 07 39 16 CC

Tranquility Base, stand by on the event timer.

04 07 39 25 CC

Tranquility Base, Houston. On my Mark start your event timer.

04 07 39 36 CC

5, 4, 3, 2, 1.

04 07 39 41 CC

MARK.

04 07 39 46 CDR (TRANQ)

Roger. We got it; thank you.

Tape 67/2 Page 328

04 07 39 47 CC

Roger, Neil.

04 07 47 19 CC

Tranquility, Houston. We see the star angle difference. Looks good.

04 07 47 29 LMP (TRANQ)

Okay. That last star was Navi, and it wasn't too well distinguishable. I can see where that error could come in. I think for the gravity alignment with one star, Rigel will be quite good.

04 07 47 42 CC

Roger. Stand by on the NOUN 93.

04 07 48 04 CC

Hello, Tranquility Base. Houston. We'd like you to torque that. Over.

04 07 49 -- BEGIN LUNAR REV 15

04 07 49 19 CDR (TRANQ)

Houston, this is Tranquility. Do you want us to accept this position? Over.

04 07 49 24 CC

Tranquility, Houston. We're looking at it. Stand by. We'd like you to pull the circuit breaker on panel 11 for the mission timer. Over.

04 07 49 35 CDR (TRANQ)

Roger. I've already done that, Charlie.

04 07 49 37 CC

Okay.

04 07 50 20 CC

Tranquility, Houston. We'd like you to reject that RLS. Over.

04 07 50 29 LMP (TRANQ)

Roger.

04 07 50 32 CC

And, Tranquility Base, Houston. We'd like you to call - after this, call P00, and give us a E memory dump.

04 07 51 24 LMP (TRANQ)

Okay. Here comes the E memory dump.

04 07 51 28 CC

Roger.

04 07 51 41 LMP (TRANQ)

And we got 1106.

04 07 51 43 CC

Roger.

Tape 67/3 Page 329

04 07 52 09 CC

Hello, Tranquility Base. Houston. Did I copy PROGRAM ALARM 1106 from you? Over.

04 07 52 16 LMP (TRANQ)

Roger. That's affirmative.

04 07 52 18 CC

Okay. Stand by.

04 07 52 19 LMP (TRANQ)

Could that, by any chance, be due to the fact that I flashed the updata link switch to DATA while that was going on? Over.

04 07 52 29 CC

Stand by.

04 07 52 38 CC

Hello, Tranquility Base. Houston. The SPAN guys think that's conceivable. Stand by. I think we want another VERB 74.

04 07 52 51 LMP (TRANQ)

Okay. Standing by.

04 07 53 02 CC

Hello, Tranquility Base. Houston. We'd like another VERB 74. Over.

04 07 53 13 LMP (TRANQ)

Roger. Here it comes.

04 07 53 54 CC

Tranquility Base, Houston. On my Mark it will be GET 103 53.

04 07 54 00 CC

MARK.

04 07 54 01 CC

103 53 - correction, 54.

04 07 54 09 CDR (TRANQ)

Roger.

04 07 54 14 CC

Hello, Tranquility. Houston. We have the LM ascent PAD. If you're ready to go. Over.

04 07 54 28 LMP (TRANQ)

Stand by.

04 07 54 38 LMP (TRANQ)

Roger. Ready to copy the LM ascent PAD.

04 07 54 42 CC

Roger, Tranquility. TIG, 104 39 47 00, 55358 00322, plus 0022. DEDA 47, plus 37130, minus 70615, plus 58620, plus 56936. Over.

04 07 55 28 LMP (TRANQ)

Roger. LM ascent PAD: 104 39 47 00, 55358 00322, plus 0022, plus 37130, minus 70615, plus 58620, plus 56936. Over.

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04 07 55 53 CC

Roger, Tranquility. Good readback. We also have a CSI PAD if you are ready to copy.

04 07 56 10 LMP (TRANQ)

Okay. We are ready to go.

04 07 56 12 CC

Roger. Coming at you with a CSI: NOUN 11, 105 35 3700, 107 11 3000, 0538, minus all zeros. FDAI is NA, 0937 - correction, 09356, 10315, plus 0538, minus all zeros, plus 0012. Over.

04 07 57 08 LMP (TRANQ)

Roger. Say again R1 and NOUN 86.

04 07 57 12 CC

Roger. R1 is plus 0538, and we have a load for you. Will you please give us P00 and DATA? Over.

04 07 57 25 LMP (TRANQ)

Roger. Before I do that I would like to designate the rendezvous radar up to plus-X.

04 07 57 30 CC

Roger.

04 07 57 44 LMP (TRANQ)

Okay. CSI readback: NOUN 11, 105 35 3700, 107 11 3000, 0538, minus all zeros, NA, 09356, 10315. NOUN 86, plus 0538, plus all zeros, and the last one was 0012. And what's the sign of that, please?

04 07 58 55 CC

Tranquility, Houston. The DELTA-VY is minus all zeros. The DELTA-VZ is plus 0012. Over.

04 07 59 08 LMP (TRANQ)

Roger. Plus 0012.

04 07 59 10 CC

Roger. Good readback.

04 07 59 41 CDR (TRANQ)

Houston, Tranquility Base. The DSKY's yours, and updata link to DATA.

04 07 59 47 CC

Roger. Thank you, Tranquility.

04 08 02 26 CC

Hello, Tranquility Base. Houston. On my Mark it will be 37 minutes to T3. Over.

04 08 02 35 CDR (TRANQ)

Okay.

04 08 02 42 CC

Stand by.

04 08 02 46 CC

MARK.

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04 08 02 47 CC

Thirty seven minutes till T3.

04 08 02 51 CDR (TRANQ)

Okay. Thank you.

04 08 03 10 CC

Tranquility, this is Houston. It's your computer. We got the load in. You can start your P57.

04 08 03 18 CDR (TRANQ)

Roger. Thank you.

04 08 05 19 LMP (TRANQ)

Houston, Tranquility Base. Does somebody down there have a mike button keyed? Over.

04 08 05 26 CC

Stand by, and we'll check.

04 08 05 42 CC

Tranquility, Houston. Do you still hear it now? Over.

04 08 05 59 LMP (TRANQ)

I still hear it. it sounds like somebody banging chairs around in the back room.

04 08 06 05 CC

Roger. That's a VOGAA that you hear for the CSM to keep the noise down on the loop. Maybe we got a MSFN relay or something. Stand by.

04 08 06 17 LMP (TRANQ)

Okay.

04 08 06 43 CC

Tranquility, Houston. We got the MSFN relay in. You're hearing the VOGAA, which is a noise suppression device. We'll try to take it out. Over.

04 08 06 55 LMP (TRANQ)

All right. Thank you.

04 08 08 00 CC

Tranquility, Houston. It ought to be a little quieter up there now. We disabled the MSFN relay.

04 08 08 11 LMP (TRANQ)

Okay. I think the noise has stopped now. Thank you, Charlie.

04 08 08 13 CC

Roger.

04 08 14 32 CC

Tranquility Base, Houston. On my Mark, 25 minutes till T3. Stand by.

04 08 14 46 CC

MARK.

04 08 14 47 CC

Twenty five minutes until T3.

04 08 14 52 CDR (TRANQ)

Roger. Thank you, Charlie.

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04 08 15 00 CMP (COLUMBIA)

Houston, Columbia. How's it going?

04 08 15 02 CC

Columbia, Houston. We're reading you about three by. Over.

04 08 15 10 CMP (COLUMBIA)

Roger. I'm on OMNI Charlie. How's it going?

04 08 15 13 CC

Roger. Understand. OMNI Charlie. Mike, be advised we have an update for you on the P22 for the LM. We estimate he landed about 4 miles downrange. Your T1 times are updated and your T2, if you're ready to copy. Over.

04 08 15 33 CMP (COLUMBIA)

Ready to copy.

04 08 15 36 CMP (COLUMBIA)

Ready to copy.

04 08 15 37 CC

Okay. Roger, Columbia. T1 104 32 24, 104 37 33, 2 miles south. Time of closest approach is 104 39 08.

04 08 16 08 CC

Hello, Tranquility Base. Houston. We copy the NOUN 93. You can torque them. Over.

04 08 17 30 CMP (COLUMBIA)

You said 4 miles long, is that correct, Houston?

04 08 17 34 CC

That's affirmative, Columbia. It's about 4 miles long. Stand by. We'll have you a map location momentarily. Over.

04 08 18 38 CDR (TRANQ)

Houston, Tranquility Base. Do you have an updated LM weight for us? Over.

04 08 18 42 CC

That's affirmative. Stand by on the DAP. Our DAP PAD for you is LM weight 10906. Over.

04 08 18 59 CDR (TRANQ)

Roger. 10906.

04 08 19 02 CC

Roger.

04 08 19 57 CC

Columbia, Houston. With a latitude/longitude over two update for LM position. Over.

04 08 20 21 CC

Columbia, Houston. Over.

04 08 20 26 CMP (COLUMBIA)

Go ahead, Houston.

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04 08 20 28 CC

Roger, Mike. We got an update on the LAT longitude for the LM, if you're ready to copy. Over.

04 08 20 36 CMP (COLUMBIA)

Go ahead.

04 08 20 41 CMP (COLUMBIA)

Go ahead.

04 08 20 42 CC

Roger. Columbia, it's plus 7 - correction, plus 0.799 for the LAT, plus 11.730 for the longitude over two. Over.

04 08 21 02 CMP (COLUMBIA)
Thank you. The altitude remain unchanged?

04 08 21 08 CC
Say again. Over.

04 08 21 12 CMP (COLUMBIA)
Does the altitude remain unchanged? ...

04 08 21 16 CC
That's affirmative.

04 08 21 31 CC
Hello, Tranquility Base. Houston. You are stay for a T3. We have some surface block data if you're ready to copy. Over.

04 08 21 40 CDR (TRANQ)
Roger. Understand we're stay for T3. Stand by.

04 08 22 27 CDR (TRANQ)
Okay, Houston. Go ahead with your block data.

04 08 22 30 CC
Roger, Tranquility. T4, 106 38 02; T5, 108 36 15; T6, 110 34 30; T7, 112 32 45. Over.

04 08 23 05 LMP (TRANQ)
Copy. T4, 106 38 07; T5, 108 36 15; T6 110 34 30; T7, 112 32 45.

04 08 23 20 CC
Roger, Tranquility. Stand by one.

04 08 23 26 CC
Tranquility, Houston. Say again your T4 copy. Over.

04 08 23 33 CDR (TRANQ)
T4, 106 38 07.

04 08 23 37 CC
Roger. Correction on T4: 106 38 02. Over.

04 08 23 49 CDR (TRANQ)
Got T4, 106 38 02.

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04 08 23 51 CMP (COLUMBIA)
...

04 08 23 53 CC
Roger.

04 08 24 51 CC
Hello, Columbia. Houston. We will not come up on the MSFN relay. We'd like you to come on panel 9, turn on your VHF to TR. Over.

04 08 25 08 CMP (COLUMBIA)
Okay. I'm on panel 9. Ready to receive. You want me to transmit for some reason with it?

04 08 25 14 CC
Say again, Mike. You're about two by.

04 08 25 21 CMP (COLUMBIA)

Roger. Panel 9 is configured VHF, RECEIVE. You want me to transmit with the HF for some reason? Why do you want me in TR?

04 08 25 31 CC

Columbia, this is Houston. We don't want you to transmit, Mike. We just want you in that position in case you want to talk to Tranquility. Break. Tranquility, Houston. Say again. Over.

04 08 25 47 CDR (TRANQ)

Roger. I have a fairly good sized difference between battery volts on 5 and 6; 6 is reading 33.5 and 5 is reading 36.5. Is that what you expect? Over.

04 08 26 03 CC

Roger. Stand by.

04 08 26 09 CC

Tranquility, Houston. They are both coming up in voltage. No problem. We're still GO. Over.

04 08 26 19 CDR (TRANQ)

Roger.

04 08 32 38 CC

Hello, Tranquility Base. Houston. Could you please give us a readout now of all of your descent tank pressures? Over.

04 08 32 56 LMP (TRANQ)

Okay, Houston. On descent 1, fuel and oxidizer are reading 10 psi; and descent 2, fuel is reading 10 psi, oxidizer 11 psi.

04 08 33 09 CC

Roger, Tranquility. Thank you much. Out.

04 08 34 55 CDR (TRANQ)

Houston, Tranquility Base is ready to go through the powerdown and terminate the simulated countdown.

04 08 35 00 CC

Roger. Standby.

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04 08 35 23 CC

Hello, Tranquility Base. Houston. You can start your powerdown now. Over.

04 08 35 31 CDR (TRANQ)

Roger. It's in progress.

04 08 35 37 CC

And, Tranquility Base, the White Team is going off now and letting the Maroon Team take over. We appreciate the great show. It was a beautiful job, you guys.

04 08 35 47 LMP (TRANQ)

Roger. Couldn't of had better agreement from all of you back there.

04 08 39 07 LMP (TRANQ)

Houston, Tranquility.

04 08 39 09 CC

Go, Tranquility. Over.

04 08 39 14 LMP (TRANQ)

Roger. Our recommendation at this point is planning an EVA with your concurrence starting about eight o'clock this evening, Houston time. That is about 3 hours from now.

04 08 39 31 CC

Stand by.

04 08 39 35 LMP (TRANQ)

Well, we will give you some time to think about that.

04 08 39 40 CC

Tranquility Base, Houston. We thought about it; we will support it. You're GO at that time. Over.

04 08 39 48 LMP (TRANQ)

Roger.

04 08 39 56 CC

You guys are getting prime time TV there.

04 08 40 08 CDR (TRANQ)

Hope that little TV set works, but we'll see.

04 08 40 11 CC

Roger.

04 08 40 33 CC

Hello, Tranquility Base. Houston. Was your eight o'clock Houston time a reference to opening the hatch or starting the PREP for EVA at that time? Over.

04 08 40 46 CDR (TRANQ)

That would be hatch opening.

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04 08 40 48 CC

That's what we thought. Thank you much.

04 08 40 52 CDR (TRANQ)

That might be a little later than that, but in other words, start the PREP in about an hour or so.

04 08 40 57 CMP (COLUMBIA)

Houston, Columbia. Copy NOUN 49?

04 08 41 00 CC

Stand by, Columbia.

04 08 41 01 CC

Tranquility Base, Houston. That's fine. We are ready to support you any time, Neil. Over.

04 08 41 04 CMP (COLUMBIA)

Roger.

04 08 41 09 CDR (TRANQ)

Roger.

04 08 41 10 CC

Break. Columbia, we see the NOUN 49. Stand by.

04 08 41 36 CC

Columbia, Houston. We got the data. We would like a VERB 34. Over.

04 08 41 46 CMP (COLUMBIA)

All right. Stand by one, Charlie, for the next one.

04 08 41 50 CC

Roger, Columbia. Did - How did Tranquility look to you down there? Over.

04 08 41 58 CMP (COLUMBIA)

Well, the area looks smooth, but I was unable to see him. I just picked out a distinguishable crater nearby and marked on it.

04 08 42 08 CC

Roger.

04 08 42 14 CMP (COLUMBIA)

It looks like a nice area, though.

04 08 42 29 CC

Hello, Columbia. Houston. I understand you could not see Tranquility. What were you marking on? Over.

04 08 42 48 CMP (COLUMBIA)

Houston, Columbia. I say again, I could not see him. AUTO optics pointed at a spot very close to the coordinates which you gave me, so I picked a tiny crater in that area and marked on it so I will be able to have repeatable data, but I was unable to see him.

04 08 42 05 CC

Roger. Copy.

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04 08 46 11 CC

Hello, Tranquility Base. Houston. On our DPS venting and that fuel problem, our heat exchanger is cleared up. We heard that the ice is melted, and we are in good shape now. Out.

04 08 49 39 CDR (TRANQ)

Houston. Tranquility is going to put the track modes in P00 now.

04 08 59 27 CC

Columbia, Houston. Over.

04 08 59 34 CMP (COLUMBIA)

Columbia. Go.

04 08 59 35 CC

Columbia, Houston. We noticed you are maneuvering very close to gimbal lock. I suggest you move back away. Over.

04 08 59 43 CMP (COLUMBIA)

Yes. I am going around it, doing this CMC AUTO maneuvers to the PAD values of roll 270, pitch 101, yaw 45.

04 08 59 52 CC

Roger, Columbia.

04 09 00 30 CMP (COLUMBIA)

How about sending me a fourth gimbal for Christmas.

04 09 00 40 CC

Columbia, Houston. You were unreadable. Say again please.

04 09 00 46 CMP (COLUMBIA)
Disregard.

04 09 01 21 CC
Columbia, Houston. Several items for you. Over.

04 09 01 28 CMP (COLUMBIA)
Ready to copy.

04 09 01 30 CC
Columbia, Houston. First of all, we'd like a waste water dump to 10 percent on the backside. Secondly, it does not look like we are going to need any plane change at this time, so we will not be uplinking a new REFSMMAT. Third item, I would like all of your CRYO heaters to AUTO, and we are ready for a battery charge, battery BRAVO; it will last about 7 hours. If you should go to sleep, we will be terminating that BATT charge, but at the moment, we can go ahead and start the BATT charge on BATT Bravo. And a final item, for your SM RCS configuration for your rest period, register 1 for the DAP is 11111; DAP register 2, 01100. And your AUTO RCS select

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switches, quad Alfa, pitch jets on only, quad Bravo all on, quad Charlie and quad Delta all off. Over.

04 09 02 57 CMP (COLUMBIA)
Roger. Dump waste water to 10 percent on the backside. Use prior REFSMMAT, CRYO heaters on to AUTO, battery B charge until I go to sleep. DAP is 11111, 01100. Select quads A pitch only on, C and D all up. Over.

04 09 03 22 CC
Columbia, Houston. Roger.

04 09 04 25 CC
Columbia, Houston. We will have a state vector update for you a little later. We are not prepared with it right now; and on another subject, from Tranquility Base, they are prepared to begin their EVA early. They expect to begin DEPRESS operations in about 3 hours at 108, approximately 108 GET. Over.

04 09 04 58 CMP (COLUMBIA)
Sounds good to me. Tell them to eat some lunch before they go.

END OF TAPE

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04 09 06 07 CC

Columbia, Houston. We'd like your PRD readouts when possible, and we've checked over your EM dump. It all looks okay.

04 09 06 48 CC

Tranquility Base, Houston. Over.

04 09 06 54 LMP (TRANQ)

Go ahead, Houston.

04 09 06 56 CC

Tranquility, Houston. We'd like your PRD readout, and we have double checked your EM dump. It all looks okay. Over.

04 09 07 26 CDR (TRANQ)

Roger. Understand our E memory dump was good. CDR's dosimeter is 11014.

04 09 07 37 LMP (TRANQ)

And LMP is 09011.

04 09 07 44 CC

Roger, Tranquility. Break. Columbia, we would like for you to REACQ with your high gain; attempt a manual lock on. Over.

04 09 08 01 CMP (COLUMBIA)

...

04 09 08 11 LMP (TRANQ)

Houston, Tranquility here. The LMP's readout may possibly be 09017. Over.

04 09 08 21 CC

Tranquility, Houston. Roger. 09017 is an update on your readout.

04 09 08 31 CMP (COLUMBIA)

Columbia's in high gain.

04 09 08 32 LMP (TRANQ)

I'll let you know for sure when it goes to either 12 or 18.

04 09 08 41 CC

Tranquility, Houston. Roger. The medics report your latter reading, 17, appears to be the correct one. Over.

04 09 08 54 LMP (TRANQ)

Roger.

04 09 09 11 CMP (COLUMBIA)

Columbia's in the high gain.

04 09 09 13 CC

Roger, Columbia. You're sounding much better now.

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04 09 09 57 CC

Columbia, Houston. Request P00 in ACCEPT, and we'll uplink another state vector. Over.

04 09 10 08 CMP (COLUMBIA)

Roger. Going P00 in ACCEPT.

04 09 12 02 CC

Columbia, Houston. Suggest you put BATT A on your BATT relay bus. Over.

04 09 12 12 CMP (COLUMBIA)

Okay.

04 09 12 46 CC

Columbia, Houston. We're through with your computer. You can go to BLOCK.

04 09 12 53 CMP (COLUMBIA)

Roger. BLOCK.

04 09 14 43 CC

Tranquility Base, Houston. Over.

04 09 14 53 LMP (TRANQ)

Go ahead, Houston. Tranquility Base.

04 09 14 55 CC

Tranquility Base, Houston. We've reviewed the checklist, and about the only change in order to advance the EVA that we've found is that you'll want to delay your lithium hydroxide change until after the EVA rather than before. Over.

04 09 15 19 LMP (TRANQ)

Roger. We'd just as soon make a change and jettison the old one. Over.

04 09 16 21 CC

Tranquility Base, Houston. We would like to delay that LOIO - LiOH change until after the EVA. There is a possibility you could jettison the canister when you jettison your PLSS. Over.

04 09 16 39 LMP (TRANQ)

All right. We'll plan it that way. Over.

04 09 16 42 CC

Roger, Tranquility.

04 09 17 52 CC

Columbia, Houston. Over.

04 09 17 58 CMP (COLUMBIA)

Houston, Columbia.

04 09 17 59 CC

Columbia, Houston. We show your EVAP OUT temperature running low. Request you go to manual temperature control and bring it up. You can check the procedures in ECS MAL 17. Over.

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04 09 18 20 CMP (COLUMBIA)

Roger, Houston.

04 09 19 49 CC

Columbia, Houston. I have a P22 update for you.

04 09 19 57 CMP (COLUMBIA)

Columbia. Go ahead.

04 09 19 59 CC

Columbia, Houston. Your P22 AUTO - AUTO optics landmark ID on LM. T1, 106 plus 30 plus 31; T2, 106 plus 35 plus 41, 2 nautical miles south. Your TCA, 106 plus 37 plus 16. Shaft angle 357.9 and trunnion angle 44.3. Over.

04 09 20 46 CMP (COLUMBIA)

Roger. Thank you.

04 09 21 35 CC

Columbia, Houston. We have your LOS in 3 minutes. AOS will be 106 plus 11. Over.

04 09 21 47 CMP (COLUMBIA)

Roger.

04 09 25 29 LMP (TRANQ)

Houston, Tranquility. Over.

04 09 25 31 CC

Tranquility, Houston. Go ahead.

04 09 25 38 LMP (TRANQ)

Roger. This is the LM pilot. I'd like to take this opportunity to ask every person listening in, whoever and wherever they may be, to pause for a moment and contemplate the events of the past few hours and to give thanks in his or her own way. Over.

04 09 26 08 CC

Roger, Tranquility Base.

04 09 35 03 LMP (TRANQ)

That's about ready to fall off.

04 09 35 07 CDR (TRANQ)

As a matter of fact, it just doesn't look like it sunk in at all.

04 09 46 -- BEGIN LUNAR REV 16

04 09 47 17 CC

Tranquility Base, Houston. We'd like some estimate of how far along you are with your eating and when you may be ready to start you EVA PREP. Over.

04 09 47 43 CDR (TRANQ)

I think that we'll be ready to start EVA PREP in about a half an hour or so.

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04 09 47 50 CC

Roger, Tranquility.

04 10 11 07 CMP (COLUMBIA)

Houston, Columbia. How do you read?

04 10 11 12 CC

Columbia, Columbia. This is Houston.

04 10 11 14 CDR (TRANQ)

Houston, this is Tranquility Base. We are beginning our EVA PREP.

04 10 11 23 CC

Tranquility Base, this is Houston, Roger. Copy. You're beginning EVA PREP. Break. Break. Columbia, Columbia, this is Houston. Reading you loud and clear. Over.

04 10 11 35 CMP (COLUMBIA)

You're loud and clear. The waste water dump is down to 10 percent. I have a question on the P22. Do you want me to do another P22, or is all that information just for my own use in tracking the LM for photographic purposes?

04 10 11 49 CC

Columbia, this is Houston. We request that you perform another P22. We'd like you to let the AUTO optics take care of the tracking and devote your energies to trying to pick out the LM on the lunar surface. If you can find the LM, of course. We're looking for marks on it; but tracking of geographical features doesn't do us all that much good. Over.

04 10 12 18 CMP (COLUMBIA)

Okay. Fine. I'll do it. And on the ECS system, the - Whatever the problem was, it seems to have gone away without any changing of J52 sensors or anything like that. My glycol evaporator outlet TEMP is up above 50 now, and it's quite comfortable in the cockpit; so we'll talk more about that one later.

04 10 12 43 CC

Roger, Columbia. Did you shift into manual control, or did the problem resolve itself under AUTO control? Over.

04 10 12 52 CMP (COLUMBIA)

The problem went away under AUTO.

Oh 10 12 55 CC

Roger. That's the best type. Out.

04 10 12 56 CMP (COLUMBIA)

I did cycle out of AUTO into - I did cycle out of AUTO into MANUAL, back into AUTO.

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04 10 13 05 CC

Houston. Roger. Out.

04 10 22 56 CC

Tranquility Base, Tranquility Base, this is Houston. Over.

04 10 23 05 CDR (TRANQ)

Go ahead, Houston.

04 10 23 07 CC

Tranquility, this is Houston. We need a second set of PRD readings so that we may establish a rate. Over.

04 10 23 19 CDR (TRANQ)

Okay. Stand by.

04 10 23 30 CDR (TRANQ)

CDR is reading 11014.

04 10 23 44 LMP (TRANQ)

LMP is reading 09017 and three quarters.

04 10 23 52 CC

Tranquility, this is Houston. We copy your readings, Out.

04 10 29 26 CMP (COLUMBIA)

Houston, Columbia. How do you read on OMNI D, Dog?

04 10 29 30 CC

Columbia, this is Houston. We're reading you loud with background noise on OMNI D. Over.

04 10 29 41 CMP (COLUMBIA)

Okay. I'll stay on D here for a while. I'm about to go into ...

04 10 29 45 CC

Roger. Out.

04 10 36 16 CMP (COLUMBIA)

Houston, Columbia. I'm coming up on my time for the first pass when I may - -

04 10 36 19 CC

Now while we've got time, you can.

04 10 36 20 CMP (COLUMBIA)

- - be able to see the LM. Do you have any topographical cue that might help me out here? AUTO optics is tracking between two craters. One of them, as the LM sees it, would be long at 11 o'clock. The other would be short and behind him at 5 o'clock. They're great big old craters - depressions.

END OF TAPE

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04 10 36 44 CC

Stand by.

04 10 37 34 CC

Columbia, this is Houston. The best we can do on topo features is to advise you to look to the west of the irregularly shaped crater, and then work on down to the southwest of it. Over.

04 10 38 05 CC

Columbia, Houston. Another possibility is the southern rim of the southern of the two oldlooking craters. Over.

04 10 38 42 CMP (COLUMBIA)

Roger, Houston. Columbia ... I kept my eyes glued to the sextant that time hoping I'd get a flash of reflected light off the LM, but I wasn't able to see any of my scan areas that you suggested.

04 10 38 56 CC

Roger. On that southern of the old craters, there's a small bright crater on the southern rim. One plot would put him slightly to the west of that small bright crater, about 500 to 1000 feet. Do you see anything down there? Over.

04 10 39 19 CMP (COLUMBIA)

Its going past now, Bruce, but I scanned that area that you are talking about very closely, and no, I did not see anything.

04 10 39 26 CC

Roger. Out.

04 10 40 21 CC

Columbia, this is Houston. Over.

04 10 40 28 CMP (COLUMBIA)

Go ahead.

04 10 40 33 CC

Columbia, this is Houston. On your LAM 2 map, we'd like to confirm the topographical area in which you were looking on this last period of sightings. As we understand you, you were looking in the vicinity of Papa 7 to November 8. Is that correct? Over.

04 10 40 59 CMP (COLUMBIA)

Stand by one.

04 10 41 01 CC

Roger.

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04 10 43 00 CMP (COLUMBIA)

Houston, Columbia.

04 10 43 02 CC

Go ahead, Columbia.

04 10 43 08 CMP (COLUMBIA)

One of the craters I was talking about is located exactly at Mike 6.7.

04 10 43 19 CC

Roger. We found that one.

04 10 43 21 CMP (COLUMBIA)

The other one is located at 7 - The other one is located at 7.2, two thirds of the way from Mike to Nan.

04 10 43 36 CC

Roger. We believe you were looking a little too far to the west and south. Over.

04 10 44 03 CMP (COLUMBIA)

Roger. Understand. I was looking where auto optics was tracking, on the average, and understand that it should have been more to the north and more to the west; actually a tiny bit outside the circle, huh?

04 10 44 17 CC

More to the north and a little more to the east. The feature that I was describing to you, the small bright crater on the rim of the large, fairly old crater, would be about Mike 0.8 and 8.2. Over.

04 10 44 40 CMP (COLUMBIA)

Well, just give me your best estimate as to his location and his coordinate system, and I'll plot it on my map and go from there.

04 10 44 48 CC

Roger.

04 10 48 54 CC

Tranquility Base, this is Houston. Can you give us some idea of where you are in the surface checklist at the present time? Over.

04 10 49 07 LMP (TRANQ)

Okay. We're at the top of page 27.

04 10 49 11 CC

Roger. Out

04 10 50 29 CMP (COLUMBIA)

Houston, Columbia. Over.

04 10 50 31 CC

Go ahead, Columbia.

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04 10 50 38 CMP (COLUMBIA)

Roger. I finally got you back on OMNI D. I've been unsuccessfully trying to get you on the high gain, and I've gone COM-MAND RESET to PROCESS. How do you read me now?

04 10 50 46 CC

Roger. Reading you loud with background noise. Understand that's OMNI Delta or OMNI Bravo? Over.

04 10 50 56 CMP (COLUMBIA)

OMNI Delta and you were cut out. I never got your coordinates on estimated LM position. Over.

04 10 51 04 CC

Columbia, this is Houston. Estimated LM position is latitude plus 0.799, longitude over 2 plus 11.730. On your chart we would place it - Stand by on the charts and readback on the latitude and longitude.

04 10 51 46 CMP (COLUMBIA)

Yes. The latitude and longitude over 2, 799 and 11730 are the ones that I been using in P22. But what I'm interested in is - is grid coordinates on that map we're using.

04 10 52 01 CC

Roger. We'll have them for you in a second.

04 10 52 08 CMP (COLUMBIA)

Thank you.

04 10 53 04 CMP (COLUMBIA)

Houston, Columbia. Could you enable the S band relay at least one way from Eagle to Columbia so I can hear what's going on?

04 10 53 12 CC

Roger. There's not much going on at the present time, Columbia. I'll see what I can do about the relay.

04 10 53 23 CC

Columbia, this is Houston. Are you aware that Eagle plans the EVA about 4 hours early? Over.

04 10 53 33 CMP (COLUMBIA)

Affirmative. When's hatch open time in GET estimated?

04 10 53 39 CC

Roger. Somewhere around 108 hours. We'll have an update for you on that a little later.

04 10 53 52 CMP (COLUMBIA)

Okay. I haven't heard a word from those guys, and I thought I'd be hearing them through your S band relay.

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04 10 53 57 CC

Roger. They're on about page Surface 27 in the checklist, proceeding in good time.

04 10 54 09 CMP (COLUMBIA)

Glad to hear it.

04 10 54 13 CMP (COLUMBIA)

You got a crowd there in MCC?

04 10 54 40 CC

Roger. You're last, Columbia.

04 10 54 46 CMP (COLUMBIA)

Roger. I expect you probably have about nine CAP COMMS and 11 Flight Directors with no place to plug in.

04 10 54 53 CC

Roger. Out.

04 10 55 00 CMP (COLUMBIA)

That ratio might even be reversed.

04 10 55 37 CMP (COLUMBIA)

Glycol evaporator outlet temperature is 50 degrees and the comfort in here is just fine.

04 10 55 43 CC

Roger. We copy 50 degrees on the glycol, and comfort index fine.

04 10 56 25 CMP (COLUMBIA)

If you'll excuse me a minute, I'm going to have a cup of coffee.

04 10 56 28 CC

Roger.

04 10 56 37 CC

Apollo - Columbia, this is Houston. Your map coordinates are Papa decimal 2 and 6 decimal 3 on the LAM 2 chart. Over.

04 10 57 10 CC

Columbia, this is Houston. Did you copy the coordinates for the LM? Over.

04 10 58 49 CC

Columbia, Columbia, this is Houston. If you read we request high gain antenna, yaw 180, pitch 0. I say again, yaw 180, pitch 0 on the high gain. Over.

04 11 02 15 CC

Columbia, Columbia, this is Houston. Do you read? Over.

04 11 05 15 CMP (COLUMBIA)

Houston, Columbia on the high gain.

04 11 05 18 CC

Columbia, this is Houston reading you loud and clear. Over.

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04 11 05 25 CMP (COLUMBIA)

Read you loud and clear, Bruce.

04 11 05 26 CC

Roger, Mike. I have the coordinates - -

04 11 05 29 CMP (COLUMBIA)

What's new?

04 11 05 31 CC

Well, what's new is I think we have some more coordinates for you on the LM location. Over.

04 11 05 41 CMP (COLUMBIA)

Ready to copy.

04 11 05 43 CC

Roger, Mike. Papa 0.2 and 6.3 on your LAM 2 chart. Over.

04 11 06 02 CMP (COLUMBIA)

Roger. Papa 0.2 and who 0.3?

04 11 06 05 CC

6.3, I say again, 6.3.

04 11 06 17 CMP (COLUMBIA)

Thank you. Papa 0.2 and 6.3. I'll try them.

04 11 06 21 CC

Roger.

04 11 06 57 CMP (COLUMBIA)

Okay. What you are saying is, if you look at the cat's paw, then that's just about, oh - his middle finger, a little bit - one to two o'clock from his middle finger. Is that right?

04 11 07 16 CC

Roger. About one to two o'clock from the middle finger if you are using 12 o'clock being to the west. Over.

04 11 07 29 CMP (COLUMBIA)

That must be the way the cat's faced. Okay. I'm with you.

04 11 07 33 CC

Okay. And I got LOS and AOS times for you.

04 11 07 40 CMP (COLUMBIA)

Go ahead.

04 11 07 48 CMP (COLUMBIA)

Go ahead, Houston.

04 11 07 50 CC

Roger. Your LOS at 107 plus 23 plus 03. AOS at 108 plus 09 plus 06. The next pass for

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COAS tracking: your time of closest approach is 108 35 28. That's 3 miles south of track. Over.

04 11 08 28 CMP (COLUMBIA)

I understand all that, but with this new information would you like me to try P22 and look for him in a different spot?

04 11 08 40 CC

Stand by a minute, please.

04 11 08 44 CMP (COLUMBIA)

Okay. Because I was looking in the wrong place last time. AUTO optics was not pointing me at the coordinates you gave me.

04 11 08 53 CC

Roger.

04 11 10 06 CC

Columbia, this is Houston. Over.

04 11 10 13 CMP (COLUMBIA)

Go ahead.

04 11 10 15 CC

On your next pass, Columbia, rather than performing a P22 as such, we would like you to look in the vicinity of the coordinates that we gave you, which is our best analysis based on map physics and the trajectory, and we also have another set of coordinates that we would like you to search in the vicinity of. This last one being based on all interpretation of the geological features that were seen by the crew on their way down. The coordinates of this second site are Mike 0.7 and 8.0. I say again, Mike 0.7 and 8.0. I say again, Mike 0.7 and 8.0. Over.

04 11 11 08 CMP (COLUMBIA)

Roger. Copy. Mike 0.7 and 8.0. The only thing is, my best tool for looking is the sextant and if I'm going to crank the sextant up, I might as well let P22 go at the same time, or don't you think so?

04 11 11 24 CC

Roger. If you want to go that way, crank it up and then you can drive it around and look where you want. Over.

04 11 11 33 CMP (COLUMBIA)

Okay.

04 11 11 35 CC

And if you can find the LM, then by all means, track it or make a note of where it was and we

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can track it on the next REV. If you are ready, we have a REFSMMAT update that we can pass up to you at this time, if you will give us P00 in ACCEPT. Over.

04 11 12 06 CMP (COLUMBIA)

Okay. P00 in ACCEPT you got. And this is an updated landing site RESFMMAT. We still believe that a plane change is not required. Is that affirmative?

04 11 12 15 CC

That's affirmative, Columbia.

04 11 12 20 CMP (COLUMBIA)

Good show.

04 11 15 34 CC

Columbia, this is Houston. We are through with the uplink. It's your computer.

04 11 15 43 CMP (COLUMBIA)

Roger. Thank you.

04 11 19 27 CMP (COLUMBIA)

Houston, Columbia.

04 11 19 30 CC

Go ahead, Columbia.

04 11 19 34 CMP (COLUMBIA)

On our next pass, I'd appreciate the S band relay mode. Over.

04 11 19 40 CC

Roger. We're working on that. There haven't been any transmissions from Tranquility Base since we last talked to you. We cannot give you a full S band relay without being assured of high gain antenna. We're working on the partial relay for you. Over.

04 11 20 00 CMP (COLUMBIA)

Okay. Understand, Bruce. Thank you very much.

04 11 20 57 CC

Columbia, this is Houston. Approximately 2 minutes to LOS. All your systems are looking good from down here. Over.

04 11 21 09 CMP (COLUMBIA)

Does it look to you like the 240 controller is properly controlling the glycol evaporator outlet TEMP? It locks all right up here.

04 11 21 19 CC

Roger, Columbia. During this pass on the front side, it looked okay to us.

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04 11 21 26 CMP (COLUMBIA)

Okay. Thank you.

04 11 31 00 CDR (TRANQ)

Houston, Tranquility Base.

04 11 31 03 CC

Go ahead Tranquility Base.

04 11 31 09 CDR (TRANQ)

Okay. We are on about the middle of page 28, Surface - 28.

04 11 31 20 CC

Roger, Tranquility. We copy

04 11 38 16 CDR (TRANQ)

All right -

04 11 40 10 CDR (TRANQ)

... minimum.

04 11 44 35 CDR (TRANQ)

I think we'd ... to put ...

04 11 45 -- BEGIN LUNAR REV 17

04 11 54 00 CC

Tranquility Base, this is Houston. Over.

04 11 54 09 LMP (TRANQ)

Roger. Go ahead, Houston.

04 11 54 11 CC

Roger, Tranquility. We're coming up in about 6 minutes on GET of 108. If you'd like to start your event timer, we can give you a hack at 108 00. Over.

04 11 54 27 CDR (TRANQ)

Wilco.

04 12 01 03 LMP (TRANQ)

Houston, Tranquility. We're ready to start with the electrical checkout. We're going to S band modulate FM. Over.

04 12 01 14 CC

Roger. Tranquility, this is Houston. We copy. Go ahead with the FM. And we missed the mark at 108. Do you want us to try and give you one at 108 05? Over.

04 12 01 27 CDR (TRANQ)

I think we've got the timer going. We've got 1 minute and 30 seconds.

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04 12 01 33 CDR (TRANQ)

MARK.

04 12 01 34 CC

Roger. We copy, and you're in SYNC with us.

04 12 02 55 CDR (TRANQ)

It's increase.

04 12 02 58 CDR (TRANQ)

T/R.

04 12 03 01 CDR (TRANQ)

In.

04 12 04 42 CDR (TRANQ)

Help you on that?

04 12 04 49 CDR (TRANQ)

Feed it, or disconnect, or what?

04 12 04 57 LMP (TRANQ)

Say again.

04 12 05 00 CDR (TRANQ)

Connect PLSS electrical umbilical to PGA.

04 12 05 16 LMP (TRANQ)

Let me *** up tight *** have to *** up straight *** up. Got her about ***

04 12 06 49 LMP (TRANQ)

That's got it.

04 12 07 21 CDR (TRANQ)

*** Right.

04 12 07 30 CDR (TRANQ)

Fastest VOX in the west.

04 12 07 37 LMP (TRANQ)

Mark. All right. Okay.

04 12 07 43 LMP (TRANQ)

Aren't they?

04 12 07 44 CDR (TRANQ)

Well, we've got antennas down and *** not real good, is it? Okay. Yours is up. We'll put my antenna up.

*** Three asterisks denote clipping of words and phrases.

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04 12 08 11 LMP (TRANQ)

Okay.

END OF TAPE

Tape 70/1 Page 354

04 12 08 13 CDR (TRANQ)

Okay.

04 12 08 14 LMP (TRANQ)

How do you read now?

04 12 08 15 CDR (TRANQ)

Okay.

04 12 08 18 LMP (TRANQ)

Okay. I think that's going to be better.

04 12 08 26 CDR (TRANQ)

You read me all right now?

04 12 08 28 LMP (TRANQ)

Yes.

04 12 08 30 CDR (TRANQ)

Okay. That sounds pretty good.

04 12 08 32 LMP (TRANQ)

I guess it's a combination of the volume and the antenna. May have been just the volume that was way up too high. Why don't you try stowing it again; see if that makes any difference.

04 12 08 52 CDR (TRANQ)

Okay.

04 12 08 53 LMP (TRANQ)

All right. 1, 2, 3, 4, 5, 5, 4, 3, 2, 1. That - That sounds pretty good.

04 12 08 58 CDR (TRANQ)

... Okay?

04 02 08 59 LMP (TRANQ)

Better keep it pretty close to your mouth, though.

04 12 09 05 CDR (TRANQ)

Okay. Open up your audio circuit breaker, and disconnect the LM COMM cable.

04 12 09 44 CC

Columbia, Columbia, this is Houston. Over.

04 12 09 53 CMP (COLUMBIA)

Houston, Columbia on the high gain. How do you read ?

04 12 09 55 CC

Roger, Columbia. Reading you loud and clear on the high gain. We have enabled the one way MSFN

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relay that you requested. The crew of Tranquility Base is currently donning PLSS's. The LMP has his PLSS on, COMM checks out, and the CDR is checking his COMM out now. Over.

04 12 10 23 CMP (COLUMBIA)

Sounds good. Thank you kindly.

04 12 10 50 CMP (COLUMBIA)

Houston, Columbia. I tweaked the platform up on the back side. I have a P52 option 3 when you're ready to copy the data.

04 12 10 58 CC

Go ahead, Columbia.

04 12 11 03 CMP (COLUMBIA)

Roger. Stars 43 and 44: star angle difference 4 balls 1, NOUN 93 plus 000 - -

04 12 11 14 LMP (TRANQ)

Audio circuit breaker CLOSED.

04 12 11 16 CMP (COLUMBIA)

- - 57, plus - -

04 12 11 17 LMP (TRANQ)

All right, on your panel, VHF A, OFF; VHF B, OFF.

04 12 11 22 CMP (COLUMBIA)

- - 00166, minus 00022, and the - -

04 12 11 26 LMP (TRANQ)

All right, RCU PTT to MAIN.

04 12 11 27 CMP (COLUMBIA)

- - time is 107 30 38. Over.

04 12 11 32 CC

Columbia, this is Houston. Copy star angle difference of 4 balls 1; NOUN 93, plus 00057 - -

04 12 11 42 LMP (TRANQ)

PLSS mode switch to B.

04 12 11 43 CC

- - plus 00166, minus 00022 - -

04 12 11 50 LMP (TRANQ)

Warning tone?

04 12 11 51 CC

- - time of 107 30 38. Over.

04 12 11 59 LMP (TRANQ)

...

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04 12 12 00 CMP (COLUMBIA)

You got it.

04 12 12 02 CC

Roger. Are you reading Tranquility Base now?

04 12 12 05 CDR (TRANQ)

Okay. You've got an O and a P.

04 12 12 06 LMP (TRANQ)

What is your O2 quantity, by the way?

04 12 12 11 CDR (TRANQ)

O2 quantity is about 91.

04 12 12 15 LMP (TRANQ)

I've got 92.

04 12 12 21 CDR (TRANQ)

Okay, now. I'm going to mode select B.

04 12 12 33 LMP (TRANQ)

Warning tone.

04 12 12 41 CDR (TRANQ)

That where you were? B?

04 12 12 44 LMP (TRANQ)

I'm in B.

04 12 12 45 CDR (TRANQ)

*** A.

04 12 12 46 LMP (TRANQ)

Okay.

04 12 12 49 CDR (TRANQ)

I'm in A.

04 12 12 51 LMP (TRANQ)

Okay. How do you read me?

04 12 12 53 CDR (TRANQ)

I read you.

04 12 12 55 LMP (TRANQ)

You're loud and clear.

04 12 12 58 LMP (TRANQ)

I got another warning tone. Go.

*** Three asterisks denote clipping of words and phrases.

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04 12 13 04 CDR (TRANQ)

*** about now? Okay?

04 12 13 06 LMP (TRANQ)

Both. That's mode select AR.

04 12 13 11 CDR (TRANQ)

AR.

04 12 13 15 LMP (TRANQ)

How do you read?

04 12 13 16 CDR (TRANQ)

Didn't get a warning tone.

04 12 13 17 LMP (TRANQ)

I got one.

04 12 13 18 CDR (TRANQ)

Got it?

04 12 13 28 CDR (TRANQ)

Okay. One antenna is out. Verify PLSS O2 bottle pressure greater than 85. ***

04 12 13 33 LMP (TRANQ)

It is.

04 12 13 35 CDR (TRANQ)

Do you have voice with ***

04 12 13 38 LMP (TRANQ)

Got her.

04 12 13 39 CDR (TRANQ)

Houston, Tranquility. How do you read ? Over.

04 12 13 43 CC

Neil, Neil, this is Houston through Tranquility. Radio check. Over.

04 12 13 53 CDR (TRANQ)

Roger. Houston, this is Neil. How do you read?

04 12 13 57 CC

Neil, this is Houston. We're reading you loud and clear. Break, break. Buzz, this is Houston through Tranquility. Over.

04 12 14 06 LMP (TRANQ)

Roger, Houston. This is Buzz through Tranquility. How do you read? Over.

04 12 14 10 CC

We're reading you loud and clear, Buzz. Out.

*** Three asterisks denote clipping of words and phrases.

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04 12 14 18 CDR (TRANQ)

*** and are you getting a signal on the TV? Over.

04 12 14 24 CC

That's affirmative, Neil. The data that we're receiving looks good and we are receiving SYNC pulses and a black signal on TV.

04 12 14 35 CDR (TRANQ)

Okay. You'll find that the area around the ladder is in a complete dark shadow so we're going to have some problem with TV, but I'm sure you will see the - You'll get a picture from the lighted horizon ...

04 12 14 53 CC

This is Houston. We copy, and right toward the end of your transmission after you mentioned lighted horizon, you trailed off down into the noise level, Neil. Over.

04 12 15 07 CDR (TRANQ)

Okay.

04 12 16 59 CC

Columbia, this is Houston. Are you reading Tranquility all right on the relay? Over.

04 12 17 07 CMP (COLUMBIA)

I believe so. I haven't heard anything fairly lately, and it's breaking up. But up until about 3 minutes ago, I was reading them loud and clear.

04 12 17 15 CC

Roger. Sounds like you're getting it all.

04 12 17 22 CMP (COLUMBIA)

Thank you.

04 12 19 22 CC

Tranquility Base, this is Houston. We request you open the TV circuit breaker at the present time. We've had it on about 15 minutes now with the MESA closed. Over.

04 12 19 37 CDR (TRANQ)

Roger.

04 12 20 22 CDR (TRANQ)

Houston, do you read ***

04 12 20 27 CC

Say again, Neil.

04 12 20 33 CDR (TRANQ)

*** Three asterisks denote clipping of words and phrases.

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04 12 20 43 CC

Neil, Neil, this is Houston. I can hear you trying to transmit; however, your transmission is breaking up. Over.

04 12 20 55 CDR (TRANQ)

Roger. ***

04 12 21 01 CC

Buzz, Buzz, this is Houston. Do you read? Over.

04 12 21 08 LMP (TRANQ)

Roger, Houston. This is Buzz. How do you read? Over.

04 12 21 11 CC

Roger. You're coming through loud and clear, Buzz. It's a beautiful signal.

04 12 21 19 LMP (TRANQ)

Neil's got his antenna up now. Let's see if he comes through any better now.

04 12 21 23 CDR (TRANQ)

Okay. Houston, this is Neil. How do you read?

04 12 21 26 CC

Neil, this is Houston. Reading you beautifully.

04 12 21 41 CDR (TRANQ)

(Static) My antenna's scratching the roof.

04 12 21 44 CC

We copy, your antenna scratching the roof. Roger.

04 12 21 59 LMP (TRANQ)

They hear everything but that.

04 12 22 01 CDR (TRANQ)

Houston, this is Tranquility. We're standing by for a GO for cabin DEPRESS. Over.

04 12 22 06 CC

Tranquility Base, this is Houston. You are GO for cabin depressurization. GO for cabin depressurization.

04 12 22 15 CDR (TRANQ)

Roger. Thank you.

04 12 22 18 LMP (TRANQ)

And the descent water valve is closed.

04 12 22 21 CDR (TRANQ)

Okay.

04 12 22 23 LMP (TRANQ)

Verify cabin fan number 1 circuit breaker open.

*** Three asterisks denote clipping of words and phrases.

Tape 70/7 Page 360

04 12 22 27 CDR (TRANQ)

*** Over, PLSS fan number 1 breaker,

04 12 22 30 LMP (TRANQ)

We'll have to pull that one out. ***

04 12 22 48 LMP (TRANQ)

Now wait a minute.

04 12 22 54 CC

Columbia, this is Houston. Your LM line of sight COMM acquisition with the Tranquility Base is 108 plus 29. LOS is 108 plus 42. Over.

04 12 23 11 LMP (TRANQ)

Suit circuits relief valve to AUTO.

04 12 23 14 CDR (TRANQ)

In AUTO.

04 12 23 15 LMP (TRANQ)

Suit gas diverter valve to EGRESS.

04 12 23 16 CMP (COLUMBIA)

I'm going over to ... I'll pick you up on OMNI C or D.

04 12 23 18 CDR (TRANQ)

GO.

04 12 23 21 CC

Stand by please.

04 12 23 22 LMP (TRANQ)

Verify MASTER ALARM.

04 12 23 26 CDR (TRANQ)

Pushbutton light RESET.

04 12 23 31 CDR (TRANQ)

*** ECS caution light and water separation light ON. Takes a while for the water separator. Maybe.

04 12 23 45 LMP (TRANQ)

I don't understand ... Suit fan number 1 circuit breaker opened.

04 12 24 09 CC

Buzz, this is Houston. We would like you to pull the suit fan DELTA P circuit breaker on panel 16. Over.

04 12 24 28 LMP (TRANQ)

Roger, I have it.

*** Three asterisks denote clipping of words and phrases.

Tape 70/8 Page 361

04 12 24 30 CDR (TRANQ)

*** that *** if, if it's in.

04 12 24 41 LMP (TRANQ)

04 12 24 50 LMP (TRANQ)

*** in EGRESS ***

04 12 25 15 CDR (TRANQ)

Okay. There it is. ECS MASTER ALARM, water separator.

04 12 25 20 LMP (TRANQ)

Okay.

04 12 25 25 CDR (TRANQ)

*** both suit isolation valves to SUIT DISCONNECT.

04 12 25 26 LMP (TRANQ)

I'll get them.

04 12 25 28 LMP (TRANQ)

Got it.

04 12 25 30 CDR (TRANQ)

Okay. Disconnect LM hoses.

04 12 25 46 LMP (TRANQ)

Okay.

04 12 25 50 CDR (TRANQ)

Connect OPS O2 hose to right hand PGA blue connector and lock.

04 12 25 54 LMP (TRANQ)

Let me do that for you.

04 12 26 04 CDR (TRANQ)

Okay. Locked and lock locked.

04 12 26 06 LMP (TRANQ)

Raise your arm up.

04 12 26 36 CDR (TRANQ)

Locked, lock locked.

04 12 26 41 CDR (TRANQ)

Okay. Retrieve purge valves from pocket.

04 12 26 48 LMP (TRANQ)

Okay.

*** Three asterisks denote clipping of words and phrases.

Tape 70/9 Page 362

04 12 26 49 CDR (TRANQ)

Verify closed; locked pin installed.

04 12 26 51 LMP (TRANQ)

Okay.

04 12 26 52 CDR (TRANQ)R

Install in RH PGA red ***

04 12 27 09 LMP (TRANQ)

Okay. It's installed, locked and lock locked.

04 12 27 14 CDR (TRANQ)

Did you put it - -

04 12 27 16 LMP (TRANQ)

Oh, wait a minute. Should be - , Stand by.

04 12 27 26 CDR (TRANQ)

Roger. ...

04 12 27 42 LMP (TRANQ)

It's right out in the middle.

04 12 27 44 CDR (TRANQ)

All right. Check my diverter valves, VERTICAL.

04 12 27 50 LMP (TRANQ)

Both VERTICAL.

04 12 27 55 CDR (TRANQ)

That's two vertical.

04 12 27 57 LMP (TRANQ)

Okay.

04 12 27 58 CDR (TRANQ)

Hold this ... in your purge valve.

04 12 28 22 LMP (TRANQ)

Locked and double locked.

04 12 28 25 CDR (TRANQ)

Okay.

04 12 28 42 CDR (TRANQ)

Position mike.

04 12 29 00 LMP (TRANQ)

Sure wished I had shaved last night.

*** Three asterisks denote clipping of word and phrases.

Tape 70/10 Page 363

04 12 29 31 LMP (TRANQ)

*** Got your mikes where you want them?

04 12 29 42 CDR (TRANQ)

Roger.

04 12 30 07 CDR (TRANQ)

Verify PLSS mode select in AR.

04 12 30 11 LMP (TRANQ)

Verified.

04 12 30 19 CMP (COLUMBIA)

I don't know if you guys can read me on VHF, but you sure sound good down there.

04 12 30 46 LMP (TRANQ)

And locked.

04 12 30 48 CDR (TRANQ)

Okay.

04 12 30 53 LMP (TRANQ)

All right. The vent window is clear. And remove LEVA from the engine cover. Verify EV visor is attached.

04 12 31 13 LMP (TRANQ)

How's the COMM now, Houston? Over.

04 12 31 16 CC

Buzz, this is Houston. The COMM is very good. You are coming in loud and clear, and Mike passes on the word that he is receiving you and following your progress with interest.

04 12 31 27 LMP (TRANQ)

Very well, thank you.

04 12 31 58 CDR (TRANQ)

Got all the material up in the back?

04 12 32 40 LMP (TRANQ)

Complete.

04 12 33 43 CDR (TRANQ)

Helmet locked?

04 12 33 46 LMP (TRANQ)

Yes. Locked and aligned.

04 12 34 47 LMP (TRANQ)
Now, if you'll pull the RCU down.

*** Thre, asterisks denote clipping of word and phrases.

Tape 70/11 Page 364

04 12 35 38 LMP (TRANQ)
Wonder if we're triggering all the time.

04 12 35 42 CDR (TRANQ)
I don't think so.

04 12 35 45 CDR (TRANQ)
Houston, Neil. How do you read?

04 12 35 48 CC
Neil, this is Houston. Read you loud and clear and I read both the comments that said: "I wonder if we're triggering all the time" and "I don't think so." Prior to that it was relatively quiet. Over.

04 12 36 01 CDR (TRANQ)
Okay. We're hearing a little bit of background noise, and I just wanted to make sure that we weren't continually keyed.

04 12 36 07 CC
Don't sound like it.

04 12 36 26 CDR (TRANQ)
Want to put the light back up?

04 12 36 36 CC
Neil, this is Houston. Would you verify your RCU vent window's clear? Over.

04 12 36 46 CDR (TRANQ)
That's verified.

04 12 36 48 CC
Roger. Out.

04 12 37 12 LMP (TRANQ)
That's good.

04 12 37 14 CDR (TRANQ)
Okay.

04 12 37 19 LMP (TRANQ)
...

04 12 37 41 CDR (TRANQ)
Okay. We can stow this.

04 12 38 03 CDR (TRANQ)
Okay. It is stowed. All right, PREP for EVA.

04 12 38 17 LMP (TRANQ)
First you connect the water hose.

04 12 38 19 CDR (TRANQ)
Okay. Let me get yours.

Tape 70/12 Page 365

04 12 38 36 LMP (TRANQ)

Okay. Now we should be able to stow these. Huh?

04 12 40 10 CC

Columbia, this is Houston. Any joy on the LM that pass? Over.

04 12 40 19 CDR (TRANQ)

Okay. They're all stowed. Connect PLSS water hose to PGA. Let's see; let me do that.

04 12 41 03 LMP (TRANQ)

Okay. That's in and locked.

04 12 41 04 CDR (TRANQ)

Okay.

04 12 41 36 LMP (TRANQ)

Houston, Buzz here. Over.

04 12 41 39 CC

Go ahead, Buzz. This is Houston.

04 12 41 44 LMP (TRANQ)

Roger. Our COMM just seemed to clear up a good bit. Did CSM just go over the hill?

04 12 41 52 CC

Negative. He's been over the hill, here, for a minute or so.

04 12 41 59 CC

Correction -

04 12 42 00 CDR (TRANQ)

Okay.

04 12 42 01 CC

He should be losing contact with you in about a minute.

04 12 42 110 LMP (TRANQ)

The flag locks are comp - checked. *** locks are checked, blue locks are checked, lock locks, red locks, purge locks; and on this side, the PLSS locks, and lock locks; both sides, water locks and the COMM.

04 12 42 32 CDR (TRANQ)

Okay.

04 12 42 34 LMP (TRANQ)

I'll fix the gloves. Locked.

04 12 44 15 CC

Columbia, this is Houston. Do you read? Over.

04 12 44 21 CMP (COLUMBIA)

Columbia reads you loud and clear on 0MNI C - Charlie.

*** Three asterisks denote clipping of word and phrases.

Tape 70/13 Page 366

04 12 44 25 CC

Roger. Columbia, I have LOS and AOS times for you this pass with MSFN. LOS 109 plus 21 plus 12. AOS coming around on the corner 110 07 35. Over.

04 12 44 52 CMP (COLUMBIA)

Thank you. That's fine.

04 12 44 53 CC

Roger. Out.

04 12 45 32 LMP (TRANQ)

Okay.

04 12 45 33 CDR (TRANQ)

Okay.

04 12 45 34 LMP (TRANQ)

All locked. Verify your diverter valve open. Up position.

04 12 45 47 LMP (TRANQ)

Diverter valve up.

04 12 45 49 CDR (TRANQ)

Diverter valves up in the minimum.

04 12 45 52 LMP (TRANQ)

PLSS pump on.

04 12 45 57 CDR (TRANQ)

PLSS *** on. Running.

04 12 46 02 LMP (TRANQ)

And mine's running, also, and it's cooling already.

04 12 46 08 CDR (TRANQ)

Me, too.

04 12 46 10 LMP (TRANQ)

Audible tone.

04 12 46 12 CDR (TRANQ)

Verified.

04 12 46 14 LMP (TRANQ)

That's what it is. Yes. *** Why don't you bend down and let me stow that. See if we ***.

04 12 46 38 LMP (TRANQ)

Mine is back to EMU. Already done that pretty well.

04 12 46 43 CDR (TRANQ)

Pretty well, complete.

*** Three asterisks denote clipping of word and phrases.

Tape 70/14 Page 367

04 12 46 47 LMP (TRANQ)
Okay.

04 12 47 08 CC
Columbia, this is Houston. Over.

04 12 47 16 CMP (COLUMBIA)
Houston, Columbia. Go ahead.

04 12 47 18 CC
Roger. Were you successful in spotting the LM on that pass? Over.

04 12 47 26 CMP (COLUMBIA)
That's negative. I checked both locations, and no joy.

04 12 47 30 CC
Okay. If you'd like to look again next pass, we have a different set of coordinates based on the onboard P57 solution of the LM. These are Echo 0.3 and 4.8. I say again Echo 0.3, 4.8, same chart. Over.

04 12 48 00 CMP (COLUMBIA)
Roger. I'll look there. And, also, how about putting that in your machine and coming out with some coordinates: latitude and longitude over 2, and altitude for P22, so it can help me as best it can.

04 12 48 14 CC
Roger.

04 12 48 21 CMP (COLUMBIA)
That P22 is still pointing in the wrong way.

04 12 48 26 CC
Columbia, this is Houston. Latitude plus 0.523, longitude divided by 2, 11.710. Over.

04 12 48 48 CMP (COLUMBIA)
Roger. Understand plus 00523 and plus 11710. Thank you.

04 12 48 58 CC
Houston. Roger. Out.

04 12 49 08 CC
Columbia, this is Houston. We're requesting high gain antenna, pitch, yaw, - pitch 0, yaw 200. That is, pitch 0, yaw 200. Over.

04 12 51 42 CDR (TRANQ)
*** cooling unit circuit ***

04 12 52 36 CDR (TRANQ)
Houston, this is Neil. How do you read?

04 12 52 39 CC
Neil, this is Houston. Loud and clear.

*** Three asterisks denote clipping of word and phrases.

Tape 70/15 Page 368

04 12 52 41 LMP (TRANQ)
Okay. That's a little bit better now. There we go.

04 12 52 42 CDR (TRANQ)

Roger. Read you and clear.

04 12 52 47 LMP (TRANQ)

You're not too loud and clear, but I think it's the same problem. Houston, how do you read Buzz?

04 12 52 52 CC

Buzz, this is Houston. Loud and clear. You're really coming in beautifully. Over.

04 12 52 58 LMP (TRANQ)

Very good.

04 12 53 00 CDR (TRANQ)

Okay. Cabin REPRESS closed.

04 12 53 33 LMP (TRANQ)

Okay.

04 12 53 41 CDR (TRANQ)

Now. Now for the gymnastics.

04 12 53 46 LMP (TRANQ)

What?

04 12 53 47 CDR (TRANQ)

Now comes the gymnastics.

04 12 53 49 LMP (TRANQ)

Oh, I think it'll be a lot easier.

04 12 53 56 CDR (TRANQ)

Okay, I want to go to DUMP and go down to 3.5 and back to AUTO.

04 12 54 08 LMP (TRANQ)

Okay, Going dump and it's down to 4.2, 4.1, - -

04 12 54 25 CDR (TRANQ)

That's 3.5. Are you in AUTO? Verify cabin pressure at 3.5 and LM suit circuit pressure between 3.6 and 4.3.

04 12 54 44 LMP (TRANQ)

It is. Suit circuit's at about 43.

04 12 54 48 CDR (TRANQ)

Okay. Verify the PGA pressure is above 45, minus 46.

04 12 54 53 LMP (TRANQ)

Minus 47.

Tape 70/16 Page 369

04 12 54 54 CC

Neil, this is Houston. Will you give us hack when you start - -

04 12 54 57 CDR (TRANQ)

04 12 54 58 CC

- - your chronometer. Over.

04 12 55 03 CDR (TRANQ)

Roger.

04 12 55 08 LMP (TRANQ)

Give it to them later.

04 12 55 12 CDR (TRANQ)

Okay. Okay, let's go to dump.

04 12 55 17 LMP (TRANQ)

Dump. Go to dump.

04 12 55 40 CDR (TRANQ)

Houston, I'll set my watch at 56. Over.

04 12 55 50 CC

Roger.

04 12 56 00 CDR (TRANQ)

3, 2, 1.

04 12 56 02 CDR (TRANQ)

MARK.

04 12 56 03 CMP (COLUMBIA)

Houston, Columbia is back on the high gain.

04 12 56 05 CC

Roger, Columbia. Loud and clear. And we copied you Mark there, Buzz.

04 12 56 09 CDR (TRANQ)

Okay. I've got my water warning.

04 12 56 18 LMP (TRANQ)

Okay. Water warning.

04 12 56 20 CDR (TRANQ)

Is that yours?

04 12 56 21 LMP (TRANQ)

Yes. Got mine.

*** Three asterisks denote clipping of word and phrases.

Tape 70/17 Page 370

04 12 56 22 CDR (TRANQ)

Okay. Cabin pressure going towards zero. Verify LM suit circuit 36 to 43. That's verified. FIPGA pressure above 4.5. Okay. 4.7, coming down. Ready to open the hatch when we get to zero.

04 12 57 06 LMP (TRANQ)

You want to bring down one of your visors now or leave them up? I'll read *** okay.

04 12 57 19 CDR (TRANQ)

Inner visor down.

04 12 58 18 CDR (TRANQ)

Four tenths of a pound in the cabin.

04 12 59 06 CDR (TRANQ)

Down to about 0,2.

04 13 01 12 LMP (TRANQ)

Sure takes a long time to get all the way down, doesn't it?

04 13 01 14 CDR (TRANQ)

Yes.

04 13 02 45 LMP (TRANQ)

Let me see if it will open now.

04 13 02 48 CDR (TRANQ)

Okay.

04 13 03 02 CDR (TRANQ)

Open my RCU there, would you, Buzz?

04 13 03 52 CDR (TRANQ)

Push outward.

04 13 04 23 CDR (TRANQ)

Need some light?

04 13 04 26 LMP (TRANQ)

It's unlocked, yes.

04 13 04 27 CDR (TRANQ)

Unlocked.

04 13 04 37 LMP (TRANQ)

That'll be good enough.

04 13 04 40 CDR (TRANQ)

It'll pop open.

*** Three asterisks denote clipping of word and phrases.

Tape 70/18 Page 371

04 13 05 23 LMP (TRANQ)

Get a steady tone in the background?

04 13 05 28 CDR (TRANQ)

I have a - static. A little bit of static.

04 13 05 34 LMP (TRANQ)

I've got a little bit of a steady tone.

04 13 05 39 CDR (TRANQ)

I don't guess I hear that.

04 13 06 15 CC

Neil, this is Houston. What's your status on hatch opening? Over.

04 13 06 22 CDR (TRANQ)

Everything is GO here. Me're just waiting for the cabin pressure to bleed so - to blow enough pressure to open the hatch. It's about 0.1 on our gage now.

04 13 06 48 LMP (TRANQ)

Sure hate to tug on that thing. Alternative would be to open *** too.

04 13 06 59 CC

Neil, this is Houston. Over.

04 13 07 04 CDR (TRANQ)

Go ahead, Houston.

04 13 07 05 CC

Roger. We're showing a relatively static pressure on your cabin. Do you think you can open the hatch at this pressure of about 1.2 psi?

04 13 07 18 CDR (TRANQ)

We're going to try it.

04 13 07 20 CC

Roger.

04 13 07 33 CDR (TRANQ)

The hatch is coming open.

04 13 07 40 LMP (TRANQ)

Okay, Hold it from going closed and I'll get the valve to - -

04 13 07 43 CDR (TRANQ)

Okay.

04 13 07 45 LMP (TRANQ)

No. I'd better get up first.

*** Three asterisks denote clipping of word and phrases.

Tape 70/19 Page 372

04 13 08 11 LMP (TRANQ)

Okay. The valves in AUTO.

04 13 08 12 CDR (TRANQ)

Okay.

04 13 08 20 LMP (TRANQ)

Might want to fill it up to FORWARD.

04 13 08 37 CDR (TRANQ)

Your window cleared yet? Your water window cleared yet?

04 13 08 46 LMP (TRANQ)

It was, yes.

04 13 08 48 CDR (TRANQ)

Mine hasn't cleared yet.

04 13 08 55 CC

Columbia, this is Houston. Over.

04 13 09 01 CMP (COLUMBIA)

Columbia. Go ahead.

04 13 09 03 CC

Columbia, this is Houston. We'd like you to cycle the fans in CRYO hydrogen tank number 1, and LOS time this orbit is 111 19 31.

04 13 09 23 CC

Correction - Make that for the next orbit. You already have the AOS/LOS for this orbit.

04 13 09 35 CMP (COLUMBIA)

Roger on time, and you want to cycle the fan in CRYO hydrogen tank 1.

04 13 09 41 CC

Roger. Out.

04 13 10 39 CDR (TRANQ)

Have you got your water valve on there?

04 13 10 41 LMP (TRANQ)

Yes.

04 13 12 35 CC

Columbia, this is Houston. We show you nearing high gain antenna scan limits. When you lose lock on us, we request OMNI Delta. OMNI Delta when you lose lock. Over.

04 13 12 52 CMP (COLUMBIA)

Roger. OMNI Delta.

04 13 13 22 CDR (TRANQ)

Okay. My window's cleared. I'm going to go to turn my cooling up a little bit.

Tape 70/20 Page 373

04 13 13 26 LMP (TRANQ)

Okay. My window's clear.

04 13 13 40 CDR (TRANQ)

All RCU windows are clear. And suit circuit is 42 - 43. And I got ascent pressure light, a VF light, and a ECS light.

04 13 14 00 LMP (TRANQ)

And we've got a water separator light. Hold it and I'll check.

04 13 14 03 CDR (TRANQ)

All right.

04 13 14 05 LMP (TRANQ)

And I'll look at your cabin fan 1 circuit breaker, and you look at glycol secondary.

04 13 14 26 LMP (TRANQ)

I've got good cooling now.

04 13 14 28 CDR (TRANQ)

Me, too.

04 13 14 35 LMP (TRANQ)

Okay. Glycol pump secondary circuit breaker open?

04 13 14 40 CDR (TRANQ)

I can see that. I have to lean this way.

04 13 14 48 LMP (TRANQ)

Can't go any further.

04 13 14 52 CDR (TRANQ)

My cabin fan 1 ***

04 13 14 58 LMP (TRANQ)

Yes, That's good.

04 13 15 00 CDR (TRANQ)

Can you check it?

04 13 15 05 LMP (TRANQ)

It's open. Verified.

04 13 15 14 CDR (TRANQ)

Okay. PGNS radar circuit breaker's open.

04 13 15 29 LMP (TRANQ)

Well, I'm looking head on at it. I'll get it.

*** Three asterisks denote clipping of word and phrases.

Tape 70/21 Page 374

04 13 15 32 CDR (TRANQ)

Okay. Let's get your antenna.

04 13 15 33 LMP (TRANQ)

You'll have to fix my antenna.

04 13 15 43 CDR (TRANQ)

Well, ready? - -

04 13 15 45 LMP (TRANQ)

About ready to go down and get some Moon rock?

04 13 15 47 CDR (TRANQ)

My antenna's out. Okay. Now we're ready to hook up the LEC here.

04 13 16 12 LMP (TRANQ)

All right. That should go down with no twists at all. Put the bag up this way, that's even. Neil, are you hooked up to it?

04 13 16 26 CDR (TRANQ)

Yes. Okay. Now we need to hook this.

04 13 16 30 LMP (TRANQ)

Move that up there.

04 13 16 34 CDR (TRANQ)

Okay.

04 13 16 38 CDR (TRANQ)

Okay. Your visor.

04 13 16 49 LMP (TRANQ)

Okay. Your back is up against the purse. All right. Now it's on top of the DSKY. Forward and up; now you are clear. Little bit toward me. Straight down, to your left a little bit. Plenty of room. Neil, you're lined up nicely. Toward me a little bit, down. Okay. Now you're clear. You're catching the first hinge on the bottom.

04 13 17 26 CDR (TRANQ)

What hinge?

04 13 17 29 LMP (TRANQ)

All right. Move, here roll to the left. Okay. Now you're clear. You're lined up on the platform. Put your left foot to the right a little bit. Okay. That's good. Roll left, Good.

04 13 17 54 CDR (TRANQ)

Okay. Now I'm going to check PLSS here.

04 13 18 05 LMP (TRANQ)

Okay. You're not quite squared away. Roll to the - roll right a little. Now you're even.

Tape 70/22 Page 375

04 13 18 14 CDR (TRANQ)

That's okay?

04 13 18 15 LMP (TRANQ)

That's good. You've got plenty of room to your left. It's a little close on the ***

04 13 18 28 CDR (TRANQ)

How am I doing?

04 13 18 29 LMP (TRANQ)

You're doing fine.

04 13 18 51 LMP (TRANQ)

Okay. Do you want those bags?

04 13 18 53 CDR (TRANQ)

Yes. Got it.

04 13 19 16 CDR (TRANQ)

Okay. Houston, I'm on the porch.

04 13 19 20 CC

Roger, Neil.

04 13 19 36 LMP (TRANQ)

Okay. Stand by, Neil.

04 13 19 37 CC

Columbia, Columbia, this is Houston. One minute and 30 seconds to LOS. All systems GO. Over.

04 13 19 46 CMP (COLUMBIA)

Columbia. Thank you.

04 13 19 47 LMP (TRANQ)

Stay where you are a minute, Neil.

04 13 19 48 CDR (TRANQ)

Okay. Need a little slack?

04 13 20 38 CDR (TRANQ)

You need more slack, Buzz?

04 13 20 40 LMP (TRANQ)

No. Hold it just a minute.

04 13 20 41 CDR (TRANQ)

Okay.

04 13 20 56 LMP (TRANQ)

Okay. Everything's nice and straight in here.

*** Three asterisks denote clipping of word and phrases.

Tape 70/23 Page 376

04 13 20 58 CDR (TRANQ)

Okay. Can you pull the door open a little more?

04 13 21 00 LMP (TRANQ)

All right.

04 12 21 03 CDR (TRANQ)

Okay.

04 13 21 07 LMP (TRANQ)

Did you get the MESA out?

04 13 21 09 CDR (TRANQ)

I'm going to pull it now.

04 13 21 18 CDR (TRANQ)

Houston, the MESA came down all right.

04 13 21 22 CC

This is Houston, Roger. We copy. And we're standing by for your TV.

04 13 21 39 CDR (TRANQ)

Houston, this is Neil. Radio check.

04 13 21 42 CC

Neil, this is Houston. Loud and clear. Break. Break. Buzz, this is Houston. Radio check, and verify TV circuit breaker in.

04 13 21 54 LMP (TRANQ)

Roger, TV circuit breaker's in, and read you five square.

04 13 22 00 CC

Roger. We're getting a picture on the TV.

04 13 22 09 LMP (TRANQ)

You got a good picture, huh?

04 13 22 11 CC

There's a great deal of contrast in it, and currently it's upside down on our monitor, but we can make out a fair amount of detail.

04 13 22 28 LMP (TRANQ)

Okay. Will you verify the position - the opening I ought to have on the camera?

04 13 22 34 CC

Stand by.

04 13 22 48 CC

Okay. Neil, we can see you coming down the ladder now.

04 13 22 59 CDR (TRANQ)

Okay. I just checked getting back up to that first step, Buzz. It's - not even collapsed too far, but it's adequate to get back up.

Tape 70/24 Page 377

04 13 23 10 CC

Roger. We copy.

04 13 23 11 CDR (TRANQ)

It takes a pretty good little jump.

Oh 13 23 25 CC

Buzz, this is Houston. F/2 - 1/160th second for shadow photography on the sequence camera.

04 13 23 35 LMP (TRANQ)

Okay.

04 13 23 38 CDR (TRANQ)

I'm at the foot of the ladder. The LM footpads are only depressed in the surface about 1 or 2 inches, although the surface appears to be very, very fine grained, as you get close to it. It's almost like a powder. Down there, it's very fine.

04 13 23 43 CDR (TRANQ)

I'm going to step off the LM now.

04 13 24 48 CDR (TRANQ)

THAT'S ONE SMALL STEP FOR (A) MAN, ONE GIANT LEAP FOR MANKIND.

04 13 24 48 CDR (TRANQ)

And the - the surface is fine and powdery. I can - I can pick it up loosely with my toe. It does adhere in fine layers like powdered charcoal to the sole and sides of my boots. I only go in a small fraction of an inch, maybe an eighth of an inch, but I can see the footprints of my boots and the treads in the fine, sandy particles.

04 13 25 30 CC

Neil, this is Houston. We're copying.

04 13 25 45 CDR (EVA)

There seems to be no difficulty in moving around as we suspected. It's even perhaps easier than the simulations at one sixth g that we performed in the various simulations on the ground. It's actually no trouble to walk around. Okay. The descent engine did not leave a crater of any size. It has about 1 foot clearance on the ground. We're essentially on a very level place here. I can see some evidence of rays emanating from the descent engine, but a very insignificant amount.

04 13 26 54 CDR (EVA)

Okay, Buzz, we ready to bring down the camera?

04 13 26 59 LMP (EVA)

I'm all ready. I think it's been all squared away and in good shape.

04 13 27 03 CDR (EVA)

Okay.

Tape 70/25 Page 378

04 13 27 05 LMP (EVA)

Okay. You'll have to pay out all the LEC. It looks like it's coming out nice and evenly.

04 13 27 13 CDR (EVA)

Okay. It's quite dark here in the shadow and a little hard for me to see that I have good footing. I'll work my way over into the sunlight here without looking directly into the Sun.

04 13 27 28 LMP (EVA)

Okay. It's taut now.

04 13 27 51 LMP (EVA)

Okay. I think you're pulling the wrong one.

04 13 27 55 CDR (EVA)

I'm just - Okay. I'm ready to pull it down now. There was still a little bit left in the -

04 13 28 01 LMP (EVA)

Okay. Don't hold it quite so tight.

04 13 28 02 CDR (EVA)

Okay.

04 13 28 17 CDR (EVA)

Looking up at the LM, I'm standing directly in the shadow now looking up at Buzz in the window. And I can see everything quite clearly. The light is sufficiently bright backlit into the front of the LM, that everything is very clearly visible,

04 13 28 55 LMP (EVA)

Okay. I'm going to be changing the ***

04 13 28 58 CDR (EVA)

Okay.

04 13 30 23 CDR (EVA)

The camera is installed on the RCU bracket, and I'm storing the LEC on the secondary strut.

04 13 30 53 CDR (EVA)

I'll step out and take some of my first pictures here.

04 13 31 05 CC

Roger. Neil, we're reading you loud and clear. We see you getting some pictures and the contingency sample.

04 13 32 19 CC

Neil, this is Houston. Did you copy about the contingency sample? Over.

04 13 32 26 CDR (EVA)

Roger. I'm going to get to that just as soon as I finish these picture series.

04 13 33 25 LMP (EVA)

Okay. Going to get the contingency sample there, Neil.

*** Three asterisks denote clipping of words and phrases.

Tape 70/26 Page 379

04 13 33 27 CDR (EVA)

Right.

04 13 33 30 LMP (EVA)

Okay. That's good.

04 13 33 58 LMP (EVA)

Okay. The contingency sample is down and it's ***. Looks like it's a little difficult to dig through the initial crust.

04 13 34 12 CDR (EVA)

This is very interesting. It's a very soft surface, but here and there where I plug with the contingency sample collector, I run into a very hard surface, but it appears to be very cohesive material of the same sort. I'll try to get a rock in here. Just a couple.

04 13 34 54 LMP (EVA)

That looks beautiful from here, Neil.

04 13 34 56 CDR (EVA)

It has a stark beauty all its own. It's like much of the high desert of the United States. It's different but it's very pretty out here. Be advised that a lot of the rock samples out here, the hard rock samples, have what appear to be vesicles in the surface. Also, I am looking at one now that appears to have some sort of phenocryst.

04 13 35 30 CC

Houston. Roger. Out.

04 13 35 43 LMP (EVA)

Okay. The handle is off the *** in about 6 or 8 inches into the surface. I could *** easy ***.

04 13 35 56 CDR (EVA)

Yes, it is. it's - I'm sure I could push it in farther, but it's hard for me to bend down further than that.

04 13 36 07 LMP (EVA)

Now, you can throw so far.

04 13 36 08 CDR (EVA)

You can really throw things a long way up here.

04 13 36 32 CDR (EVA)

That pocket open, Buzz?

04 13 36 35 LMP (EVA)

Yes, it is. It's not up against your suit though. Hit it back once more. More toward the inside. Okay. That's good.

04 13 36 37 CDR (EVA)

That in the pocket?

04 13 36 42 LMP (EVA)

Yes. Push down.

*** Three asterisks denote clipping of words and phrases.

Tape 70/27 Page 380

04 13 36 55 CDR (EVA)

Got it?

04 13 36 57 LMP (EVA)

No. It's not all the way in. Push it. There you go.

04 13 37 08 CDR (EVA)

Contingency sample is in the pocket. My oxygen is 81 percent. I have no flags, and I'm in minimum flow.

04 13 37 22 CC

This is Houston. Roger, Neil.

04 13 37 40 LMP (EVA)

Okay. I have got the cameras on at one frame a second.

04 13 37 44 CDR (EVA)

Okay.

04 13 37 52 LMP (EVA)

And I've got the 80 percent, no flags.

04 13 38 00 CDR (EVA)

Are you getting a TV picture now, Houston?

04 13 38 05 CC

Neil, yes we are getting a TV picture.

04 13 38 22 CC

Neil, this is Houston. We're getting a picture. You're not in it at the present time. We can see the bag on the LEC being moved by Buzz, though. Here you come into our field of view.

04 13 38 33 CDR (EVA)

...

04 13 38 35 LMP (EVA)

Roger.

04 13 38 36 CDR (EVA)

Hold it a second. First let me move that over the edge for you.

04 13 38 41 LMP (EVA)

Okay. Are you ready for me to come out?

04 13 38 42 CDR (EVA)

Yes. Just stand by a second. I'll move this over the handrail.

04 13 39 06 CDR (EVA)

Okay.

04 13 39 07 LMP (EVA)

All right. That's got it. Are you ready?

04 13 39 11 CDR (EVA)

All set. Okay. You saw what difficulties I was having. I'll try to watch your PLSS from underneath here.

END OF TAPE

Tape 71/1 Page 381

04 13 39 43 LMP (EVA)

All right. The backup camera's positioned.

04 13 39 57 CDR (EVA)

Okay. Your PLSS is - Looks like it is clearing okay. Your toes are about to come over the sill. Okay. Now drop your PLSS down. There you go; you're clear. And laterally you're good. You've got an inch clearance on top of your PLSS.

04 13 40 18 LMP (EVA)

Okay. You need a little bit of arching of the back to come down. ... How are are my feet from the edge?

04 13 40 27 CDR (EVA)

Okay. You're right at the edge of the porch.

04 13 40 30 LMP (EVA)

Okay. Back in *** little of foot movement *** porch. Little arching of the back. Helmet comes up and clears the bulkhead without any trouble at all.

04 13 40 48 CDR (EVA)

Looks good.

04 13 41 08 CC

Neil, this is Houston. Based on your camera transfer with the LEC, do you foresee any difficulties in SRC transfer? Over.

04 13 41 18 CDR (EVA)

Negative.

04 13 41 28 LMP (EVA)

Okay. Now I want to back up and partially close the hatch.

04 13 41 47 LMP (EVA)

Making sure not to lock it on my way out.

04 13 41 53 CDR (EVA)

(Laughter) A pretty good thought.

04 13 41 56 LMP (EVA)

That's our home for the next couple of hours and we want to take good care of it. Okay. I'm on the top step and I can look down over the RCU, landing gear pads. It's a very simple matter to hop down from one step to the next.

04 13 42 18 CDR (EVA)

Yes. I found I could be very comfortable, and walking is also very comfortable.

04 13 42 28 CDR (EVA)

You've got three more steps and then a long one.

*** Three asterisks denote clipping of words and phrases.

Tape 71/2 Page 382

04 13 42 42 LMP (EVA)

Okay. I'm going to leave that one foot up there and both hands down to about the fourth rung up.

04 13 42 50 CDR (EVA)

There you go.

04 13 42 53 LMP (EVA)

Okay. Now I think I'll do the same ***

04 13 43 01 CDR (EVA)

A little more. About another inch.

04 13 43 05 CDR (EVA)

THERE YOU GOT IT.

04 13 43 08 CDR (EVA)

That's a good step. About a 3-footer.

04 13 43 16 LMP (EVA)

Beautiful view!

04 13 43 18 CDR (EVA)

Isn't that something! Magnificent sight out here.

04 13 43 24 LMP (EVA)

Magnificent desolation.

04 13 43 47 LMP (EVA)

Looks like the secondary strut *** little thermal effects on it right here, Neil.

04 13 43 54 CDR (EVA)

Yes. I noticed that. That seems to be the worst, although similar effects are on - all around.

04 13 44 -- BEGIN LUNAR REV 18

04 13 44 07 MS

... powder, isn't it?

04 13 44 09 CDR (EVA)

Isn't it fine?

04 13 44 11 LMP (EVA)

Right in this area I don't think there's much of any *** fine powder *** clods together, and it's hard to tell whether it's a clod or a rock.

04 13 44 23 CDR (EVA)

Notice how you can kick it out.

04 13 44 28 LMP (EVA)

Yes. And it bounces and then -

04 13 44 55 LMP (EVA)

Reaching down is fairly easy. I got my suit dirty at this stage.

*** Three asterisks denote clipping of words &nd phrases.

Tape 71/3 Page 383

04 13 45 11 LMP (EVA)

The mass of the backpack does have some effect in inertia.

04 13 45 30 LMP (EVA)

There's a slight tendency, I can see now, to *** backwards *** due to the soft, very soft texture.

04 13 45 45 CDR (EVA)

You're standing on a rock, a big rock there now.

04 13 46 01 LMP (EVA)

This pad sure didn't ***

04 13 46 05 CDR (EVA)

No. It didn't.

04 13 46 08 LMP (EVA)

There's absolutely no crater there at all from the engine.

04 13 46 10 CDR (EVA)

No.

04 13 46 12 LMP (EVA)

I wonder if about right under the engine is where the probe might have hit.

04 13 46 20 CDR (EVA)

I'd like that.

04 13 46 25 CDR (EVA)

Yes. I think that's a good representation of our sideward velocity at touchdown there - hole at the probe.

04 13 46 30 LMP (EVA)

I see that probe over on the minus-Y strut. It's broken off and bent back up.

04 13 46 40 CDR (EVA)

It did, didn't it? The other two both bent over.

04 13 47 04 LMP (EVA)

Can't say too much for the visibility right here without the visor up. It's dark. It looks like there is a *** surface of it is *** pounded rock *** And incidentally, these rocks *** very powdery surface ***

04 13 47 40 CC

Say again, please, Buzz; you're cutting out.

04 13 47 45 LMP (EVA)

I say that the rocks are rather slippery.

04 13 47 50 CC

Roger.

04 13 47 52 LMP (EVA)

A powdery surface when the sun hits. *** they split up all the very little fine porouses *** Will tend to slide over it rather easily.

04 13 48 25 LMP (EVA)

Traction *** seems quite good. ***

*** Three asterisks denote clipping of words and phrases.

Tape 71/4 Page 384

04 13 48 30 LMP (EVA)

*** About to lose my balance in one direction and recovery is a quite natural and very easy *** And, moving your arms around, Jack, doesn't *** off the surface *** not quite that light-footed.

04 13 49 06 CDR (EVA)

And, I have the insulation off the MESA now and MESA seems to be in good shape.

04 13 49 13 LMP (EVA)

Got to be careful that you are leaning in the direction you want to go, otherwise you *** slightly inebriated. In other words, you have to cross your foot over to stay underneath where your center-of-mass is.

04 13 49 37 LMP (EVA)

And, Neil, didn't I say we might see some purple rocks?

04 13 49 42 CDR (EVA)

Find a purple rock?

04 13 49 44 LMP (EVA)

Yes. They are small, sparkly *** fragments *** places *** would make a first guess that some sort of biotite *** We'll leave that to further analysis ***

04 13 50 28 LMP (EVA)

*** compact underneath *** completely no *** you don't sink down more than ... a quarter of an inch.

04 13 50 59 CDR (EVA)

Okay, Houston. I'm going to change lenses on you.

04 13 51 05 CC

Roger, Neil.

04 13 51 30 CDR (EVA)

Okay, Houston. Tell me if you're getting a new picture.

04 13 51 35 CC

Neil, this is Houston. That's affirmative. We're getting a new picture. You can tell it's a longer focal length lens. And for your information, all LM systems are GO. Over.

04 13 51 46 LMP (EVA)

We appreciate that. Thank you.

04 13 52 19 LMP (EVA)

Neil is now unveiling the plaque *** gear.

04 13 52 27 CC

Roger. We got you boresighted, but back under one track.

*** Three asterisks denote clipping of words and phrases.

Tape 71/5 Page 385

04 13 52 40 CDR (EVA)

For those who haven't read the plaque, we'll read the plaque that's on the front landing gear of this LM. First there's two hemispheres, one showing each of the two hemispheres of the Earth. Underneath it says "Here Man from the planet Earth first set foot upon the Moon, July 1969 A.D. We came in peace for all mankind." It has the crew members' signatures and the signature of the President of the United States.

04 13 53 35 CDR (EVA)

Ready for the camera?

04 13 53 38 LMP (EVA)

No. I'll get it. No, you take this TV on out.

04 13 53 45 CDR (EVA)

Watch the LEC, there.

04 13 53 53 LMP (EVA)

Now I'm afreid these ... materials are going to get dusty ***

04 13 54 07 LMP (EVA)

The surface material is powdery. *** How good your lens is, but if you can *** smudges ... very much like a very finely powdered carbon, but it's very pretty looking.

04 13 54 40 CDR (EVA)

Would you pull out some of my cable for me, Buzz?

04 13 54 58 LMP (EVA)

Houston. How close are you able to get things in focus ?

04 13 55 02 CC

This is Houston. We can see Buzz's right hand. It is somewhat out of focus. I'd say we were focusing down to probably - oh, about 8 inches to a foot behind the position of his hand when he was pulling out the cable.

04 13 55 21 LMP (EVA)

Okay. How's the temperature on there?

04 13 55 25 CDR (EVA)

Temperature of the camera is showing zero.

04 13 55 32 LMP (EVA)

I'm a little cool. I think I'll trade ***

04 13 55 43 LMP (EVA)

I'm on intermediate now, Houston, and I show 3.78. No flags, 70 ***

04 13 55 50 CC

Houston. Roger. Out.

04 13 55 57 LMP (EVA)

And, we'll probably need a little *** distance *** back location *** television camera.

*** Three asterisks denote clipping of words and phrases.

Tape 71/6 Page 386

04 13 56 14 LMP (EVA)

Neil, look at the minus Y-strut, the direction of travel there *** travel from right to left.

04 13 56 24 CDR (EVA)

Right.

04 13 56 25 LMP (EVA)

This one over here underneath the ascent engine where the probe first hit - the minus-Y probe first hit.

04 13 56 35 CDR (EVA)

I got plenty of cable?

04 13 56 38 LMP (EVA)

You've got plenty. Plenty more.

04 13 56 48 LMP (EVA)

Okay. I think I've got the end of it.

04 13 56 51 CDR (EVA)

Something interesting: in the bottom of this little crater here - It may be -

04 13 57 01 LMP (EVA)

Now keep going. We've got a lot more.

04 13 57 03 CDR (EVA)

Okay.

04 13 57 04 LMP (EVA)

Getting a little harder to pull out, here.

04 13 57 30 CDR (EVA)

How far would you say I am, Buzz?

04 13 57 33 LMP (EVA)

Forty, 50 feet. Why don't you turn around and let them get a view from there and see what the field of view looks like?

04 13 57 42 CDR (EVA)

Okay.

04 13 57 45 LMP (EVA)

You're backing into the cable.

04 13 57 46 CDR (EVA)

Okay.

04 13 57 50 LMP (EVA)

Turn around to your right, would be better.

04 13 57 53 CDR (EVA)

I don't want to go into the Sun if I can avoid it.

04 13 57 55 LMP (EVA)

That's right. Yes.

04 13 57 59 CDR (EVA)

I'll just leave it - -

04 13 58 01 LMP (EVA)

- - All right.

04 13 58 02 CDR (EVA)

- - sit like that and walk around it.

*** Three asterisks denote clipping of words and phrases.

Tape 71/7 Page 387

04 13 58 06 LMP (EVA)

Houston. How's that field of view going to pick up the MESA? *** far away?

04 13 58 15 CC

Roger.

04 13 58 20 CC

Neil, this is Houston. The field of view is okay. We'd like you to aim it a little bit more to the right. Over.

04 13 58 28 CDR (EVA)

Okay.

04 13 58 32 LMP (EVA)

Okay. That's all the cable we have. *** not going out. I'll start working on the solar wind - -

04 13 58 40 CC

A little bit too much to the right. Can you bring it back left about 4 or 5 Degrees?

04 13 58 50 CC

Okay. That looks good Neil.

04 13 58 55 CDR (EVA)

Okay, now. Do you think I ought to be farther away, or closer?

04 13 59 01 LMP (EVA)

Can't get too much further away.

04 13 59 05 CDR (EVA)

Let's try it like that for a while. I'll get a couple of panoramas with it, here.

04 13 59 13 CC

Roger. You look okay as far as distance goes, Neil. And we'll line you up again when you finish the panorama. Now you're going too fast on the panorama sweep. You're going to have to stop, or -

04 13 59 28 CDR (EVA)

I haven't stopped - I haven't set it down yet. That's the first picture in the panorama. Right there.

04 13 59 35 CC

Roger.

04 13 59 40 CDR (EVA)

It's taken just a little - about north, north east.

04 13 59 52 CDR (EVA)

Tell me if you've got a picture, Houston.

04 13 59 54 CC

We've got a beautiful picture, Neil.

04 13 59 58 CDR (EVA)

Okay. I'm going to move it.

*** Three asterisks denote clipping of words and phrases.

Tape 71/8 Page 388

04 14 00 10 CC

Okay. Here's another good one.

04 14 00 23 CC

Okay, we got that one.

04 14 00 29 CDR (EVA)

Okay. Now, this one is right down front, straight west. And I want to know if you can see an angular rock in the foreground.

04 14 00 41 CC

Roger. We have a large angular rock in the foreground, and it looks like a much smaller rock a couple of inches to the left of it. Over.

04 14 00 52 CDR (EVA)

All right. And then on beyond it about 10 feet is an even larger rock that's very rounded. That rock is about - The closest one to

you is about sticking out of the sand about 1 foot. And it's about a foot and one half long, and it's about 6 inches thick, but it's standing on edge.

04 14 01 16 CC

Roger.

04 14 01 26 LMP (EVA)

Okay, Neil. I've got the table out and the bag deployed.

04 14 01 33 CC

We've got this view, Neil.

04 14 01 42 CDR (EVA)

This is straight south.

04 14 01 45 CC

Roger. And we see the shadow of the LM.

04 14 01 48 CDR (EVA)

Roger. The little hill just beyond the shadow of the LM is a pair of elongate craters about - probably the pair together is about 40 feet long and 20 feet across, and they're probably 6 feet deep. We'll probably get some more work in there later.

04 14 02 20 CC

Roger. We see Buzz going about his work.

04 14 02 22 CDR (EVA)

How's that for a final?

04 14 02 26 CC

For a final orientation, we'd like it to come left about 5 degrees. Over.

04 14 02 36 CC

Now back to the right about half as much.

04 14 02 42 CDR

Okay?

04 14 02 53 CC

Okay. That looks good there, Neil.

Tape 71/9 Page 389

04 14 03 00 CDR (EVA)

Okay.

04 14 03 20 CDR (EVA)

Okay. You can make a Mark, Houston. *** deployed.

04 14 03 24 CC

Roger. Solar wind.

04 14 03 36 LMP (EVA)

And, incidently, you can use the shadow that the staff makes to *** getting it perpendicular ***

04 14 03 50 CC

Roger.

04 14 04 05 LMP (EVA)

Some of these small depressions *** tend to sink - oh, maybe 2 or 3 inches. *** suggest exactly what the Surveyor pictures sho-

wed when they pushed away a little bit. You get a force transmitted through the upper surface of the soil and about 5 or 6 inches of bay breaks loose and moves as if it were caked on the surface, when in fact it really isn't.

04 14 04 43 CDR (EVA)

I noticed in the soft spots where we had footprints nearly an inch deep that the soil is very cohesive and it will retain a - will retain a slope of probably 70 degrees along side of the footprints.

04 14 06 29 CDR (EVA)

Okay?

04 14 06 30 LMP (EVA)

Yes. I think that's excellent.

04 14 06 39 LMP (EVA)

They didn't come off?

04 14 06 46 LMP (EVA)

*** get the ***

04 14 07 01 CDR (EVA)

*** that part? *** a rock here.

04 14 07 38 LMP (EVA)

You'll have to extend that one.

04 14 07 58 CC

Columbia, Columbia, this is Houston. Over.

04 14 08 26 LMP (EVA)

04 14 08 53 CMP (COLUMBIA)

Houston, Columbia on the high gain. Over.

04 14 08 55 CC

Columbia, this is Houston. Reading you loud and clear. Over.

04 14 09 03 CMP (COLUMBIA)

Yes. Reading you loud and clear. How's it going?

*** Three asterisks denote clipping of words or phrases.

Tape 71/10 Page 390

04 14 09 05 CC

Roger. The EVA is progressing beautifully. I believe they are setting up the flag now.

04 14 09 14 CMP (COLUMBIA)

Great.

04 14 09 18 CC

I guess you're about the only person around that doesn't have TV coverage of the scene.

04 14 09 25 CMP (COLUMBIA)

That's all right. I don't mind a bit.

04 14 09 33 CMP (COLUMBIA)

How is the quality of the TV?

04 14 09 35 CC

Oh, it's beautiful, Mike. It really is.

04 14 09 39 CMP (COLUMBIA)

Oh, gee, that's great! Is the lighting half way decent?

04 14 09 43 CC

Yes, indeed. They've got the flag up now and you can see the stars and stripes on the lunar surface.

04 14 09 50 CMP (COLUMBIA)

Beautiful. Just beautiful.

04 14 10 16 LMP (EVA)

That's good. See if you can pull that end off a little bit. Take that end up a little.

04 14 10 33 CDR (EVA)

It won't pull out.

04 14 10 39 CDR (EVA)

Okay.

04 14 12 21 CC

Neil, this is Houston. Radio check. Over.

04 14 12 27 CDR (EVA)

Roger, Houston. Loud and clear.

04 14 12 29 CC

Roger. Out.

04 14 12 30 LMP (EVA)

Loud and clear, Houston.

04 14 12 32 CC

Roger, Buzz.

04 14 13 15 LMP (EVA)

I'd like to evaluate the various paces that a person can *** traveling on the lunar surface. I believe I'm out of your field of view. Is that right, now, Houston?

*** Three asterisks denote clipping of words and phrases.

Tape 71/11 Page 391

04 14 13 30 CC

That's affirmative, Buzz.

04 14 13 37 CC

You are in our field of view now.

04 14 13 42 LMP (EVA)

Okay. You do have to be rather careful to keep track of where your center of mass is. Sometimes, it takes about two or three paces to make sure you've got your feet underneath you.

04 14 14 05 LMP (EVA)

About two to three or maybe four easy paces can bring you to a nearly smooth stop. *** change directions, like a football player, you just have to to *** foot out to the side and cut a little bit.

04 14 14 38 LMP (EVA)

So called kangaroo hop does work, but it seems that your forward mobility is not quite as good as - it is in the conventional - more conventional one foot after another.

04 14 15 06 LMP (EVA)

It's hard saying what a sane pace might be. I think it's the one that I'm using now - would get rather tiring after several hundred *** but this may be a function of this suit, as well as lack of gravity forces.

04 14 15 47 CC

Tranquility Base, this is Houston. Could we get both of you on the camera for a minute, please?

04 14 16 00 CDR (EVA)

Say again, Houston.

04 14 16 02 CC

Roger. We'd like to get both of you in the field of view of the camera for a minute.

04 14 16 09 CC

Neil and Buzz, the President of the United States is in his office now and would like to say a few words to you. Over.

04 14 16 23 CDR (EVA)

That would be an honor.

04 14 16 25 CC

Go ahead, Mr. President. This is Houston. Out.

THE FOLLOWING IS A MESSAGE FROM RICHARD M. NIXON, PRESIDENT OF THE UNITED STATES; THE MESSAGE ORIGINATED FROM THE OVAL ROOM OF THE WHITE HOUSE, WASHINGTON, DISTRICT OF COLUMBIA

04 14 16 30 PRESIDENT NIXON

Neil and Buzz, I am talking to you by telephone from the Oval Room at the White House, and this certainly has to be the most historic telephone

*** Three asterisks denote clipping of words and phrases.

Tape 71/12 Page 392

call ever made. I just can't tell you how proud we all are of what you *** for every American. This has to be the proudest day of our lives. And for people all over the world, I am sure they, too, join with Americans in recognizing what an immense feat this is. Because of what you have done, the heavens have become a part of man's world. And as you talk to us from the Sea of Tranquility, it inspires us to redouble our efforts to bring peace and tranquility to Earth. For one priceless moment in the whole history of man, all the people on this Earth are truly one; one in their pride in what you have done, and one in our prayers that you will return safely to Earth.

04 14 17 44 CDR (EVA)

Thank you, Mr. President. It's a great honor and privilege for us to be here representing not only the United States but men of peace of all nations, and with interest and a curiosity and a vision for the future. It's an honor for us to be able to participate here today.

04 14 18 12 PRESIDENT NIXON

And thank you very much and I look forward - All of us look forward to seeing you on the Hornet on Thursday.

04 14 18 21 LMP (EVA)

I look forward to that very much, sir.

04 14 18 31 CC

Columbia, Columbia, this is Houston. Over.

04 14 18 37 CMP (COLUMBIA)

Loud and clear, Houston.

04 14 18 39 CC

Roger. I got a P22 AUTO optics - AUTO optics PAD for you.

04 14 18 53 CMP (COLUMBIA)

Roger. Go ahead.

04 14 18 56 CC

Roger. P22 landmark ID, LM: T1, 110 26 56; T2, 110 32 06. Three miles south; time of closest approach, 110 33 40. Shaft 353.855, trunnion 46.495, roll zero, pitch 250, yaw zero. Over.

04 14 19 53 CMP (COLUMBIA)

Roger. Thank you. Readback not required.

04 14 19 55 CC

Roger. Out.

*** Three asterisks denote clipping of words and phrases.

Tape 71/13 Page 393

04 14 20 06 LMP (EVA)

Houston, it's very interesting to note that when I kick my foot *** with no atmosphere here, and this gravity *** they seem to leave, and most of them have about the same angle of departure and velocity. From where I stand, a large portion of them will impact at a certain distance out. Several *** the percentage is, of course, that will impact *** different regions *** it's highly dependent upon *** the initial trajectory upward *** where most of the *** already the particles are found, ... terrain.

04 14 21 08 CC

Roger, Buzz. And break. Break. Columbia, this is Houston. When you track out of high gain antenna, then let's request OMNI Delta, OMNI Delta. Over.

04 14 21 20 CMP (COLUMBIA)

So be it.

04 14 21 24 LMP (EVA)

I've noticed several times in going from the sunlight into the shadow, that just as I go in, I catch an additional reflection off the LM *** along with the reflection off my face onto the visor, makes visibility very poor just at the transition *** sunlight into the shadow. I essentially have so much glare coming onto my visor *** shadow *** helmet actually gets the shadow. Then it takes a short while for my eyes to adapt to the lighting conditions. *** inside the shadow area, visibility, as we said before, is not too great, but both visor's up *** what sort of footprints we have and the general condition of the soil. Then, after being out in the sunlight a while, it takes - Watch it, Neil! Neil, you're on the cable.

04 14 22 40 CDR (EVA)

Okay.

04 14 22 41 LMP (EVA)

Yes. Lift up your right foot, right foot. It's still - your toe is still hooked in it.

04 14 22 45 CDR (EVA)

That one?

04 14 22 46 LMP (EVA)

Yes. It's still hooked in it. Wait a minute. Okay. You're clear now.

*** Three asterisks denote clipping of words and phrases.

Tape 71/14 Page 394

04 14 22 51 CDR (EVA)

Thank you.

04 14 22 55 LMP (EVA)

Now, let's move that over this way.

04 14 23 04 LMP (EVA)

Okay. I've got it.

04 14 23 32 LMP (EVA)

The blue color of my boots has completely disappeared now into this *** still don't know exactly what color to describe this other than ash cocoa color. It seems to be covering most of the lighter part of the boot *** color that *** very fine particles ***.

04 14 24 11 CC

Buzz, this is Houston. You're cutting out on the end of your transmissions. Can you speak a little more closely into your microphone? Over.

04 14 24 23 LMP (EVA)

Roger. I'll try that.

04 14 24 25 CC

Beautiful.

04 14 24 30 LMP (EVA)

Well, I had that one inside my mouth that time.

04 14 24 35 CC

It sounded a little wet.

04 14 25 09 LMP (EVA)

In general, time spent in the shadow doesn't seem to have any *** thermal effects. *** inside the suit. There is a difference, of course, in the ... radiation and the helmet. So I think there's a tendency to feel a little cooler in the shadow than the Sun.

04 14 25 41 CC

Columbia, this is Houston. Over.

04 14 26 05 CC

Columbia, this is Houston. Over.

04 14 26 55 CC

Columbia, this is Houston. Over.

04 14 27 03 CMP (COLUMBIA)

Houston, Columbia in Delta.

04 14 27 05 CC

Roger. You should have VHF AOS with the LM right about now. VHF LOS will be about 40 minutes 15 seconds. Over.

04 14 27 20 CMP (COLUMBIA)

Thank you.

*** Three asterisks denote clipping of words and phrases.

Tape 71/15 Page 395

04 14 28 22 LMP (EVA)

As I look around the area, the contrast, in general, is *** comes about completely by virtue of the shadow *** down Sun ... very light colored gray, light gray color, a halo around my own shadow, around the shadow of my helmet. Then, as I look off across *** the contrast becomes strongest in that the surrounding color is still fairly light. As you look down into the Sun *** a larger amount of *** shadowed area is looking toward us. The general color of the *** surrounding *** the contrast is not as great. Surveying all the dusty area that we've kicked up *** considerably darker in texture. Now, I've kicked up one, and I imagine that this is *** Surveyor. The same is true when I survey across on - along the area that we're walking. In general *** to the fact that there are footprints there. General terrain where I've been kicking up a lot of this surface material is generally of a darker contrast *** color.

04 14 31 29 LMP (EVA)

The panorama I'll be taking is about 30 or 40 feet out to plus ***

04 14 31 39 CC

Say again which strut, Buzz?

04 14 31 43 LMP (EVA)

The plus Z strut.

04 14 31 47 CC

Roger.

04 14 31 48 LMP (EVA)

And right in this area, there are two craters. The one that's right in front of me now as I look off in about the eleven o'clock position from the spacecraft, about 30 to 35 feet ... There's several eral rocks and boulders 6 to 8 inches across ... sizes.

04 14 34 13 LMP (EVA)

I'm now in the area of the minus Y strut taking some ... photographs.

04 14 35 52 LMP (EVA)

How's the bulk sample coming, Neil?

04 14 35 56 CDR (EVA)

Bulk sample is just being sealed.

04 14 36 58 CMP (COLUMBIA)

Houston, Columbia.

04 14 37 01 CC

Columbia, this is Houston. Go ahead. Over.

*** Three asterisks denote clipping of words and phrases.

Tape 71/16 Page 396

04 14 37 09 CMP (COLUMBIA)

Roger. No marks on the LM that time. I did see a suspiciously small white object whose coordinates are - -

04 14 37 25 CC

Go ahead with the coordinates on the small white object.

04 14 37 28 CMP (COLUMBIA)

Easy - Easy 0.3, 7.6, but I ... right on the southwest end of a crater. I think they would know it if they were in such a location. It looks like their LM would be pitched up quite a degree. It's on the southwest wall of a smallish crater.

04 14 37 58 CC

Roger. Copy Echo 0.3 and 7.6, and -

04 14 38 27 CC

Columbia, this is Houston. While I'm talking to you, LOS will be at 111 19 31; AOS, 112 05 43. Over.

04 14 39 04 CC

Columbia, this is Houston. Did you copy LOS AOS times? Over.

04 14 39 14 CMP (COLUMBIA)

Negative, Houston. You broke. Disregard. I'll get them off the flight plans.

04 14 39 19 CC

Roger. Out.

04 14 39 56 LMP (EVA)

The jet deflector that's mounted on quad 1 seems to be a good bit more wrinkled *** right now on quad 4.

04 14 40 12 CC

You're breaking up again, Buzz.

04 14 40 18 LMP (EVA)

I say the jets deflector that's mounted on quad 4 seems to be - the surface of it seems to be more wrinkled than the one that's on quad 1. Generally, underneath part of the LM seems to have stood up quite well to the *** get some pictures in the aft part of the LM that will illuminate the thermal effects much better than we could get them up here in the front.

04 14 40 53 CC

Roger. Out.

04 14 40 58 LMP (EVA)

We're going to get some particular photographs of the bulk sample area, Neil?

*** Three asterisks denote clipping of words and phrases.

Tape 71/17 Page 397

04 14 41 07 CDR (EVA)

Okay.

04 14 41 25 LMP (EVA)

And, Houston? Buzz here. I'm showing 3.78 psi, 63 percent, no flags, adequate, slight warming *** fingered.

04 14 42 01 CDR (EVA)

Roger. And Neil has 66 percent O2, no flags, minimum cooling, and the suit pressure is 382.

04 14 42 14 CC

Houston. Roger. Out.

04 14 42 39 CC

Buzz, this is Houston. Have you removed the closeup camera from the MESA yet? Over.

04 14 42 50 LMP (EVA)

Negative. Thank you.

04 14 43 18 LMP (EVA)

*** get the panorama now. Okay.

04 14 43 33 LMP (EVA)

Did you get it?

04 14 43 50 CDR (EVA)

Houston, how does our timeline appear to be going?

04 14 43 55 CC

Roger. It looks like you're about a half hour slow on it. We're working on consumables. Over.

04 14 44 03 CDR (EVA)

All right.

04 14 44 45 CC

Neil and Buzz, this is Houston. To clarify my last, your consumables are in good shape at this time. The 30 minute reference was with respect to the nominal timeline. Over.

04 14 45 03 CDR (EVA)

Roger. I understand that.

04 14 46 36 CDR (EVA)

I don't note any abnormalities in the LM. The pods seem to be in good shape. The primary and secondary struts are in good shape. Antennas are all in place. There's no evidence of problem underneath the LM due to engine exhaust or drainage of any kind.

04 14 47 17 CC

Roger. Out.

04 14 47 18 LMP (EVA)

It's very surprising, the very surprising lack of penetration of all four of the foot pads. I'd say if we were to try and determine just how far below the surface they would have penetrated, you'd measure maybe 3 inches, wouldn't you say, Neil?

*** Three asterisks denote clipping of words and phrases.

Tape 71/18 Page 398

04 14 47 37 CDR (EVA)

At the most, yes. That Y strut there is probably even less than that.

04 14 47 55 LMP (EVA)

Nice paint job.

04 14 48 04 LMP (EVA)

I get a picture of the plus Y strut taken from near the descent stage, and I think we'll be able to see a little bit better what the thermal effects are. Seem to be quite minimal.

04 14 48 48 LMP (EVA)

There's one picture taken in the right rear of the spacecraft looking at the skirt of the descent stage, shows a quite darkening of the surface color, a rather minimal amount of radiating or etching away or erosion of the surface. On descent, both of us remarked that we could see a large amount of very fine dust particles moving out. It was reported beforehand that we would probably see an upgassing from the surface after actual engine shutdown, but as I recall, I was unable to confirm that.

04 14 50 26 LMP (EVA)

This is too big an angle, Neil.

04 14 50 34 CDR (EVA)

Yes. I think you are right.

04 14 51 29 LMP (EVA)

We're back at the minus Z strut now. *** very little force of impact that we actually had.

04 14 52 01 LMP (EVA)

And, Neil, if you'll take the camera, I'll get to work on the SEQ bay.

04 14 52 05 CDR (EVA)

Okay.

04 14 52 07 CC

Columbia, Columbia, this is Houston. I notice that -

04 14 52 16 CC

Go ahead, Buzz.

04 14 52 20 LMP (EVA)

Taking some close up pictures of that rock.

04 14 52 27 LMP (EVA)

I was saying that, Houston, *** stop and take a photograph or something and then want to start moving again sideways, there's quite a tendency to start doing it with just gradual sideways hops until you start getting ***

04 14 52 47 CC

Roger.

*** Three asterisks denote clipping of words and phrases.

Tape 71/19 Page 399

04 14 52 57 LMP (EVA)

Can you see us underneath the LM over at the SEQ bay, Houston?

04 14 53 00 CC

Yes indeed, Buzz. We can see your feet sticking our underneath the structure of the LM descent stage.

04 14 53 08 LMP (EVA)

Okay. I'm just on the other side of the - -

04 14 53 13 CC

Now we can see you through the structure of the minus Z secondary strut.

04 14 53 38 LMP (EVA)

All right. The doors are open, and it looks like they are going to stay up without any problem.

04 14 53 46 CC

Columbia, Columbia, this is Houston. We are about to lose you on the OMNI's. Request high gain antenna, REACQ mode Fish 20, yaw 135. Over.

04 14 54 03 LMP (EVA)

You want to pick an area, Neil?

04 14 54 05 CC

Make that yaw 175, Columbia, yaw 175 on the high gain.

04 14 54 14 CMP (COLUMBIA)

Columbia is locked up on the high gain, Houston.

04 14 54 16 CC

Roger. Out.

04 14 55 42 LMP

Houston, the passive seismometer has been deployed manually.

04 14 55 49 CC

Roger.

04 14 56 30 LMP (EVA)

And the manual deployment of the LR cubed, the little spring that is at the end of the string is pulled off of the picks head. However, I was able to reach up and get hold of the picks head and pull it loose. So, it will be deployed manually, also.

04 14 56 51 CC

Roger.

04 14 57 05 CDR (EVA)

And, the panorama is complete. *** and the LM - got the LM at 7 30 position at about 60 feet.

04 14 57 39 CDR (EVA)

And the doors are closed and locked.

04 14 57 43 CC

Roger.

04 14 57 50 LMP (EVA)

Have you got us a good area picked out?

Tape 71/20 Page 400

04 14 57 53 CDR (EVA)

Yes. I think right out on that rise out there is probably as good as any.

04 14 58 08 CDR (EVA)

I'll probably stay on the high ground there and - -

04 14 58 16 LMP (EVA)

Watch it; the edge of that crater is - drops - -

04 14 58 19 CDR (EVA)

Yes. It drops off there, doesn't it?

04 14 58 24 LMP (EVA)

Get a couple of close ups on these quite rounded large boulders.

04 14 58 44 CDR (EVA)

About 40 feet out - I'd say out at the end of that next - -

04 14 58 50 LMP (EVA)

It's going to be a little difficult to find a good level spot here.

04 14 58 55 CDR (EVA)

The top of that next little ridge there. Wouldn't that be a pretty good place?

04 14 59 03 LMP (EVA)

All right. Should I put the LR cubed right about here?

04 14 59 07 CDR (EVA)

All right.

04 14 59 10 LMP (EVA)

I'm going to have to get on the other side of this rock here.

04 14 59 19 CDR (EVA)

I would go right around that crater to the left there. Isn't that a level spot there?

04 14 59 25 LMP (EVA)

I think this right here is just as level.

04 15 00 00 CDR (EVA)

These boulders look like basalt, and they have probably 2 percent white minerals in them, the white crystals. And the thing that I reported as the vesicular before, I'm not - I don't believe I believe that any more. I think that small craters - they look like little impact craters where shot - B B shot has hit the surface.

04 15 02 08 LMP (EVA)

Houston. I have the seismic experiment flipped over now, and I'm aligning it, but I'm having a little bit of difficulty getting the B B in the center. It wants to move around and around on the outside. ***

*** Three asterisks denote clipping of words and phrases.

Tape 71/21 Page 401

04 15 02 34 CC

You're cutting out again, Buzz.

04 15 02 49 LMP (EVA)

Roger. I say I'm not having too much success in leveling the PSE experiment.

04 15 03 57 CDR (EVA)

The laser reflector is installed and the bubble is leveled and the alignment appears to be good.

04 15 04 16 CC

Neil, this is Houston. Roger. Out.

04 15 04 23 LMP (EVA)

Hey, you want to take a look at this B B and see what you make out of it?

04 15 04 30 CDR (EVA)

I find it pretty hard to get perfectly level, too.

04 15 04 37 LMP (EVA)

That B B likes the outside. It won't go on the inside.

04 15 04 48 CDR (EVA)

That little cup is convex now, instead of concave.

04 15 04 53 LMP (EVA)

I think you're right.

04 15 04 56 CDR (EVA)

Believe it is.

04 15 04 57 LMP (EVA)

Houston, I don't think there's any hope for using this leveling device to come up with an accurate level. It looks to me as though the cup here that the B B is in is now convex instead of concave. Over.

04 15 05 19 CC

Roger, 11. Press on. If you think it looks level by eyeball, go ahead.

04 15 05 28 LMP (EVA)

Okay.

04 15 06 03 CDR (EVA)

...

04 15 06 20 CDR (EVA)

There you go. Good work; good show. Hey, whoa; stop, stop! Back up.

04 15 06 34 LMP (EVA)

Houston, as I was spacing the PSE, the right hand solar array deployed automatically. The left hand I had to manually *** the bar at the far end.

04 15 06 56 LMP (EVA)

All parts of the solar array are clear of the ground now.

04 15 07 02 CC

Buzz, this is Houston. I understand that you did successfully deploy both solar arrays. Over.

*** Three asterisks denote clipping of words and phrases.

Tape 71/22 Page 402

04 15 07 10 LMP (EVA)

Roger. That's affirmative. And there isn't any way of telling whether that's lined up. I'm getting in the way; maybe I can get down here.

04 15 07 38 LMP (EVA)

Neil, how does that appear to be pointing?

04 15 08 08 CC

Neil, this is Houston. Over.

04 15 08 13 CDR (EVA)

Go ahead, Houston.

04 15 08 15 CC

Roger. We've been looking at your consumables, and you're in good shape. Subject to your concurrence, we'd like to extend the duration of the EVA 15 minutes from nominal. We will still give Buzz a hack at 10 minutes for heading in. Your current elapsed time is 2 plus 12. Over.

04 15 08 45 CDR (EVA)

Okay. That sounds fine.

04 15 08 47 CC

Roger. Out.

04 15 09 07 CC

Buzz, this is Houston. If you're still in the vicinity of the PSE, could you get a photograph of the ball level? Over.

04 15 09 16 CDR (EVA)

I'll do that, Buzz.

04 15 09 18 LMP (EVA)

Right. We'll get a photograph of that. Houston, what time would you estimate we could allow for the documented sample? Over.

04 15 09 43 CDR (EVA)

Oh, shoot. Would you believe the ball is right in the middle now?

04 15 09 50 LMP (EVA)

Wonderful. Take a picture before it moves.

04 15 10 00 CC

Neil, this is Houston. We're estimating about 10 minutes for the documented sampling. Over.

04 15 10 25 CC

Columbia, Columbia, this is Houston. Over.

04 15 10 34 CMP (COLUMBIA)
Go ahead, Houston. Columbia.

04 15 10 36 CC
Roger. Like you to terminate charging battery Bravo at 111 plus 15. Over.

*** Three asterisks denote clipping of words and phrases.

Tape 71/23 Page 403

04 15 10 47 CMP (COLUMBIA)
How about right now?

04 15 10 49 CC
Roger.

04 15 11 15 CC
Buzz, this is Houston. You've got about 10 minutes left now prior to commencing your EVA termination activities. Over.

04 15 11 31 LMP (EVA)
Roger. I understand.

04 15 12 32 CC
Tranquility Base, this is Houston. The passive seismic experiment has been uncaged and we're observing short period oscillations in it. Over.

END OF TAPE

Tape 72/1 Page 404

04 15 15 13 LMP (EVA)

I hope you're watching how hard I have to hit this into the ground, to the tune of about 5 inches, Houston.

04 15 15 22 CC

Roger.

04 15 15 35 LMP (EVA)

It almost looks wet.

04 15 15 46 CDR (EVA)

Got a sample.

04 15 15 57 LMP (EVA)

Wait a minute. Wait a minute. Wait a minute, you cut the cable again.

04 15 16 03 CC

All right, Neil and Buzz, this is Houston. We'd like you to - -

04 15 16 04 MS

...

04 15 16 10 CDR (EVA)

That clear?

04 15 16 11 LMP (EVA)

Not quite.

04 15 16 13 CC

Neil, this is Houston. We'd like you all to get two core tubes and the solar wind experiment; two core tubes and the solar wind. Over.

04 15 16 25 CDR (EVA)

Roger.

04 15 16 51 LMP (EVA)

Okay. While I'm getting the next one, maybe you can - ... away the box a little bit.

04 15 17 04 CDR (EVA)

...

04 15 18 04 CC

Buzz, this is Houston. You have approximately 3 minutes until you must commence your EVA termination activities. Over.

04 15 18 14 LMP (EVA)

Roger. Understand.

04 15 18 22 CC

Columbia, this is Houston. Approximately 1 minute to LOS. Over.

04 15 18 32 CMP (COLUMBIA)

Columbia. Roger.

04 15 18 37 CC

And, do you plan on commencing your sleep on the backside this pass? If so, we'll disable uplink to you while we're talking to the LM. Over.

04 15 18 51 CMP (COLUMBIA)

Negative that.

Tape 72/2 Page 405

04 15 18 59 LMP (EVA)

Houston, were you able to record the documentary way where the two core tube samples were taken?

04 15 19 12 CC

Negative. Out.

04 15 19 19 CDR (EVA)

I didn't get a stereopair of those two, but they are right in the vicinity of the solar wind.

04 15 19 29 CC

Neil, this is Houston. After you've got the core tubes and the solar wind, anything else that you can throw into the box would be acceptable.

04 15 19 44 CDR (EVA)

Righto.

04 15 19 58 CDR (EVA)

Cap ...

04 15 20 01 LMP (EVA)

I got the cap.

04 15 20 03 CDR (EVA)

Got the cap?

04 15 20 04 LMP (EVA)

They're both good caps on ...

04 15 20 05 CDR (EVA)

Okay.

04 15 20 07 LMP (EVA)

And, you want to pick up some stuff, and I'll - -

04 15 20 09 CDR (EVA)

Get these aseptic ones.

04 15 20 11 LMP (EVA)

- - Move the solar wind in.

04 15 21 05 CC

Buzz, this is Houston. It's about time for you to start your EVA closeout activities.

04 15 21 16 LMP (EVA)

Roger. That's in progress.

04 15 22 20 CC

Neil and Buzz, this is Houston. We'd like to remind you of the closeup camera magazine before you start up the ladder, Buzz.

04 15 22 30 LMP (EVA)

Okay. Got that over with you, Neil?

04 15 22 34 CDR (EVA)

No, the closeup camera's underneath the MESA. I'll have to pick it up with the prong. I'm picking up several pieces of really vesicular rock out here, now.

04 15 22 53 LMP (EVA)

You didn't get anything in those environmental samples, did you?

04 15 22 56 CDR (EVA)

Not yet.

Tape 72/3 Page 406

04 15 22 59 LMP (EVA)

Well, I don't think we'll have time.

04 15 23 07 CC

Roger, Neil and Buzz. Let's press on with getting the closeup camera magazine and closing out of the sample return container. We're running a little low on time.

04 15 23 19 LMP (EVA)

Roger.

04 15 24 04 LMP (EVA)

Okay. Can you quickly stick this in my pocket, Neil, and I'll head on up the ladder?

04 15 24 07 CDR (EVA)

Okay.

04 15 24 18 LMP (EVA)

I'll hold it. You open the packet up.

04 15 24 39 CDR (EVA)

... that'd kill us. Just hold it right there. Okay. Let the pocket go.

04 15 24 49 LMP (EVA)

About through?

04 15 24 52 CDR (EVA)

Got it.

04 15 24 53 LMP (EVA)

Okay. Adios, amigo.

04 15 24 56 CDR (EVA)

Okay.

04 15 24 58 LMP (EVA)

Anything more before I head on up, Bruce?

04 15 25 04 CC

Negative. Head on up the ladder, Buzz.

04 15 25 57 LMP (EVA)

How are you coming, Neil?

04 15 25 58 CDR (EVA)

Okay.

04 15 26 22 CDR (EVA)

Did you get that solar wind rolled up there, Buzz?

04 15 26 24 LMP (EVA)

Right. That's it right there.

04 15 26 25 CDR (EVA)

Okay.

04 15 26 47 LMP (EVA)

Think you can reach the - reach this hook that's hanging over here? You might entertain the idea of sending up the second one that way.

04 15 26 59 CDR (EVA)

Okay.

04 15 27 05 LMP (EVA)

Get the film off of that.

04 15 27 08 CDR (EVA)

I will. Get that up now.

04 15 27 23 LMP (EVA)

Okay. I'm heading on in.

Tape 72/4 Page 407

04 15 27 24 CDR (EVA)

Okay.

04 15 27 26 LMP (EVA)

And I'll get the LEC all ready for the rock box.

04 15 28 02 CC

Neil, this is Houston. Did the Hasselblad magazine go up on that sample return container also?

04 15 28 12 CDR (EVA)

I've got the Hasselblad magazine hooked to the SRC now, yes.

04 15 28 17 CC

Roger.

04 15 28 58 CDR (EVA)

How are you doing, Buzz?

04 15 29 00 LMP (EVA)

I'm okay.

04 15 29 34 LMP (EVA)

About ready to send up the LEC?

04 15 29 39 CDR (EVA)

Yes. Just about.

04 15 30 01 LMP (EVA)

Okay.

04 15 30 45 LMP (EVA)

Okay. That's got it clear.

04 15 31 04 CDR (EVA)

Oh. Uh - oh. The camera came off. I mean the film pack came off.

04 15 31 30 LMP (EVA)

Okay. Just ease it down now. Don't pull so hard on it. All right, let it go.

04 15 31 46 CDR (EVA)

While you're getting that, I've got to get the camera.

04 15 31 55 LMP (EVA)

Okay. This - This one's in. No problem.

04 15 31 58 CDR (EVA)

Okay. Stand by a second.

04 15 32 02 CC

Neil, this is Houston. Request an EMU check. Over.

04 15 32 09 CDR (EVA)

Roger. Got 3.8 and I got 54 on the O2 and no flags, and my flow is in N.

04 15 33 46 CC

Neil and Buzz, for your information, your consumables remain in good shape. Out.

04 15 33 53 LMP (EVA)

Roger, How's it coming, Neil?

04 15 33 56 CDR (EVA)

Okay. I've got one side hooked up to the second box and I've got the film pack on.

04 15 34 01 LMP (EVA)

Okay. Good.

Tape 72/5 Page 408

04 15 34 20 CDR (EVA)

Boy, that bilge from on the LEC is kind of falling all over me while I'm doing this.

04 15 34 30 LMP (EVA)

All that soot, huh?

04 15 34 36 CDR (EVA)

That's what it looks like down here.

04 15 34 43 LMP (EVA)

I think my watch stopped, Neil.

04 15 34 47 CDR (EVA)

Did it?

04 15 35 01 LMP (EVA)

No, it didn't either. Second hand.

04 15 35 12 LMP (EVA)

Okay. If you can just kind of hold it, why, I think I can do the pulling.

04 15 35 16 CDR (EVA)

Okay. Stand by a minute. Let me move back.

04 15 35 40 LMP (EVA)

Okay. Easy. All right, easy in the hatch now.

04 15 35 51 LMP (EVA)

Okay. I'll get it the rest of the way. And I'll give it to you to - No, wait, just a second. Yes, a little more.

04 15 36 32 CDR (EVA)

Buzz?

04 15 36 33 LMP (EVA)

Okay. It's unhooked.

04 15 36 39 CDR (EVA)

How about that - package out of your - brief. Get that?

04 15 36 54 LMP (EVA)

No.

04 15 36 56 CDR (EVA)

Okay. I'll get it when I get up there.

04 15 37 02 LMP (EVA)

... now?

04 15 37 04 CDR (EVA)

...

04 15 37 12 CDR (EVA)

Okay?

04 15 37 13 LMP (EVA)

Okay.

04 15 37 21 CC

Neil, this is Houston. Did you get the Hasselblad magazine?

04 15 37 35 CDR (EVA)

Yes, I did. And we got about, I'd say, 20 pounds of carefully selected, if not documented, samples.

04 15 37 42 CC

Houston. Roger. Well done. Out.

Tape 72/6 Page 409

04 15 37 48 CDR (EVA)

...

04 15 38 08 LMP (EVA)

Just keep your head down close. Now start arching your back. That's good. Plenty of room. Now, all right, arch your back a little, your head up against *** Roll right just a little bit. Head down. ... in good shape.

04 15 38 26 CDR (EVA)

Thank you. Am I bumping now?

04 15 38 33 LMP (EVA)

No, you're clear. You're rubbing up against me a little bit.

04 15 38 36 CDR (EVA)

Okay?

04 15 38 38 LMP (EVA)

*** All right. That's right. A bit to the left. Okay. Now move your foot, and I'll get the hatch.

04 15 38 58 CDR (TRANQ)

Okay.

04 15 39 13 LMP (TRANQ)

Okay. The hatch is closed and latched, and verified secure.

04 15 39 25 CDR (TRANQ)

Okay. Now we turn the feedwater valve - CLOSED. And I got your PLSS antenna ...

04 15 39 52 LMP (TRANQ)

Okay. Feedwater valve's CLOSED.

04 15 40 02 LMP (TRANQ)

And your antenna's ...

04 15 40 16 CDR (TRANQ)

Okay.

04 15 40 20 LMP (TRANQ)

...

04 15 40 23 CDR (TRANQ)

Okay. That's out. ... I did my part ... Okay.

04 15 40 37 LMP (TRANQ)

...

04 15 40 44 CC

This is Houston. Go ahead.

04 15 40 49 LMP (TRANQ)

*** Three asterisks denote clipping of words and phrases.

Tape 72/7 Page 410

04 15 40 54 CC

You're cutting out, Neil. You're not readable. I understand you said something about contingency sample container on the ascent engine?

04 15 41 11 CC

We are not reading you, Neil. Buzz, Buzz, this is Houston. Do you read? Over.

04 15 41 24 LMP (TRANQ)

04 15 41 28 CC

Tranquility Base, this is Houston. We're reading neither one of you, but standing by.

04 15 42 -- BEGIN LUNAR REV 19

04 15 52 46 CC

Neil, this is Houston. Neil, this is Houston. Radio check. Over.

04 15 52 58 CC

Buzz, Buzz, this is Houston. Radio check, radio check. Over.

04 15 53 31 CDR (TRANQ)

Houston. ***

04 15 53 38 CC

This is Houston. I copy a transmission calling Houston; all else was broken up. Over.

04 15 54 12 CC

Neil, this is Houston. If you read, we suggest you unstow one PLSS antenna so we can have communications. Over.

04 15 56 08 CDR (TRANQ)

Okay *** read?

04 15 56 18 CDR (TRANQ)

A, receive. B, off.

04 15 56 25 CC

Neil, this is Houston. We seem to be reading you now. How do you read us? Over.

04 15 56 ?? CDR (TRANQ)

ICS, push to talk.

04 15 56 44 CDR (TRANQ)

Houston, this is Tranquility. How do you read?

*** Three asterisks denote clipping of words and phrases.

Tape 72/8 Page 411

04 15 56 47 CC

Tranquility Base, this is Houston. Loud and clear. How us?

04 15 56 53 CDR (TRANQ)

Loud and clear. We're in the process of switching over to LM COMM here.

04 15 56 56 CC

Roger.

04 15 59 41 CC

Tranquility Base, this is Houston. We'd like to verify your steerable antenna in track mode slew. We're going to do a communications handover here on Earth. Over.

04 15 59 55 LMP (TRANQ)

Roger. That's affirmative. We're in track mode slew.

04 16 00 00 CC

Roger. Out.

04 16 06 06 CC

Columbia, Columbia, this is Houston. Over.

04 16 06 12 CMP (COLUMBIA)

Roger, Columbia on Charlie. How do you read?

04 16 06 16 CC

Roger, Columbia. This is Houston. Reading you loud and clear on OMNI Charlie. The crew of Tranquility Base is back inside their base, repressurized, and they're in the process of doffing the PLSS's. Everything went beautifully. Over.

04 16 06 36 CMP (COLUMBIA)

Hallelujah.

04 16 06 38 CC

And we'd like to get P00 and ACCEPT from you. We have a state vector uplink. And, after that, we'd like you to realign your platform to the new REFSMMAT that we sent up a REV or two ago. Over.

04 16 06 59 CMP (COLUMBIA)
Roger. Understand. You want a option 1, P52 option 1.

04 16 08 53 CC
Columbia, this is Houston. We're going to uplink you a new state vector, and then we'll send the REFSMMAT up again, because sending the state vector up will wipe out the one that you have on board; and then you can do a P52 option 1. Over.

04 16 09 11 CMP (COLUMBIA)
P52.

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04 16 14 44 CC
Columbia, this is Houston. Do you read? Over.

04 16 14 53 CMP (COLUMBIA)
Roger, Houston. Columbia's reading you.

04 16 14 56 CC
Okay, Columbia. We've completed the uplink; the computer is yours. You can go BLOCK; however, we'd like you to hold off on the P52 option 1 align until after you've passed landing site 2; and we're requesting that you perform another P22 and attempt to find the LM this pass. I've got some numbers for you when you're ready to copy. Over.

04 16 15 22 CMP (COLUMBIA)
Roger. Stand by.

04 16 15 49 CMP (COLUMBIA)
Ready to copy.

04 16 15 51 CC
Roger, Columbia. P22 landmark ID is lunar module - make that Tranquility Base; P1, 112 25 08; P2, 112 30 17, 4 nautical miles south. Time of closest approach, 112 31 52; shaft 357. 051, trunnion 047. 432, roll zero, pitch 250, yaw zero. Readback. Over.

04 16 17 06 CC
Columbia, this is Houston. Did you copy my P22 update? Over.

04 16 17 39 CMP (COLUMBIA)
Houston, Columbia.

04 16 17 45 CC
Columbia, this is Houston. Did you copy my P22 PAD?

04 16 18 03 CC
Columbia, this is Houston. Do you copy my PAD? Over.

04 16 18 09 CMP (COLUMBIA)
Negative, Bruce. Just give me the latitude and longitude over 2, altitude, and the grid squares. Never mind the other. You're broken up.

04 16 18 21 CC
Stand by.

04 16 18 30 CMP (COLUMBIA)
Well, that is, if you have new information. Otherwise, I'll just use the old numbers.

04 16 18 34 CC
No, wait a minute. We've got new information.

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04 16 18 39 CMP (COLUMBIA)
Okay.

04 16 20 42 CC
Tranquility Base, this is Houston. Can you give us some idea of how you're progressing on the PLSS doffing and preparation for DEPRESS?

04 16 20 56 CDR (TRANQ)
Roger, Houston. Tranquility Base. We're in the process of using up what film we have, and I'm just getting ready to change the primary ECS canister. Over.

04 16 21 14 CC
Roger, Tranquility. We'd like to hold off as long as possible on the lithium hydroxide canister. Make that one of the last things you do in getting ready for the DEPRESS, if you can. Over.

04 16 21 31 CDR (TRANQ)
Roger. We're planning on doing that. I was just wondering how much longer we want to wait, though. We've probably got another half an hour's worth of picture taking, and I guess we could run through an eat cycle and then change the canister, and then DEPRESS. Over.

04 16 21 56 CC
Roger. That sounds fine to us.

04 16 22 02 CDR (TRANQ)
Well, it'll be a little crowded in here for a while.

04 16 22 06 CC
Well, we don't mind a bit.

04 16 22 20 CMP (COLUMBIA)
Houston, Columbia. You got the new coordinates?

04 16 22 27 CC
Columbia. This is Houston. Go ahead.

04 16 22 34 CMP (COLUMBIA)
Roger, Have you got the new coordinates for me?

04 16 22 37 CC
Roger. Latitude 00.691 - that would be plus 00.691 - and longitude over 2 is plus 11.713. The altitude is minus 1.44 nautical miles. Over.

04 16 23 15 CMP (COLUMBIA)
Roger. Thank you.

04 16 23 31 CC
Columbia, this is Houston. On latitude, make that plus 00.692, rounding off. Over.

04 16 23 45 CMP (COLUMBIA)
Okay.

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04 16 23 59 CMP (COLUMBIA)
Okay. I read back plus 00.692, plus 11713, and minus 00144. And you have a grid square for me?

04 16 24 10 CC

Roger. Standby.

04 16 24 25 CC

Columbia. This is Houston. Grid coordinates: Kilo 0.9, 6.3, on LAM 2. Over.

04 16 24 38 CMP (COLUMBIA)

Kilo 0.9 and 6.3. Thank you. One of these grid squares is about as much as you can scan on a single pass.

04 16 24 48 CC

Roger.

04 16 25 22 CC

And for your information, Columbia, you're approaching the VHF line of site COMM limit with Tranquility Base. LOS will be at 38 minutes plus 25 seconds. Over.

04 16 25 40 CMP (COLUMBIA)

Roger.

04 16 25 42 CC

Roger. And we've had to disable the one way MSFN relay owing to a ground site reconfiguration down here. Over.

04 16 25 53 CMP (COLUMBIA)

Okay.

04 16 33 59 CMP (COLUMBIA)

Houston, Columbia. ...

04 16 34 06 CC

This is Houston. Go ahead. Over.

04 16 34 12 CMP (COLUMBIA)

Roger. I can't see them.

04 16 34 17 CC

Roger. I guess that takes care of the news for today, Mike.

04 16 34 23 CMP (COLUMBIA)

All right. Roger.

04 16 34 29 CC

You might be interested in knowing, Mike, that we have gotten reflections back from the laser reflector ray they deployed, and we may be able to get some information out of that a little later.

04 16 34 45 CMP (COLUMBIA)

Roger. I need a very precise position, because I can only do a decent job of scanning maybe one

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of those grid squares at a time. The area that we've been sweeping covers 10's and 20's and 30's of them.

04 16 35 00 CC

Roger. We understand. This is intended to be your last P22. We don't want to use up too much fuel in this effort. Over.

04 16 35 12 CMP (COLUMBIA)

Roger. How's the fuel coming?

04 16 35 18 CC

Roger. There's no problem fuel wise. It's just that there seems to be a limit to the number of P22's and the number of grid squares you can search over.

04 16 35 32 CMP (COLUMBIA)

Roger. Well, I'll continue this maneuver then to roll 82, pitch 218, yaw zero, if that's okay with you, and do a P52 in that attitude. And that'll be a sleep ...

04 16 35 48 CC

Roger. That's fine with us. And P52 in that attitude.

04 16 35 59 CC

Roger. A P52 and then the sleep attitude.

04 16 43 46 CC

Tranquility Base, this is Houston. Over.

04 16 43 52 LMP (TRANQ)

Houston, Tranquility Base. Go ahead.

04 16 43 55 CC

Roger. When you all have a free moment, I have your T8 through T12 block data. Over.

04 16 44 08 LMP (TRANQ)

Roger. Stand by one.

04 16 45 24 LMP (TRANQ)

Houston, Tranquility Base. Ready to copy.

04 16 45 29 CC

Roger, Tranquility. T8, 114 30 57; T9, 116 29 10; T10, 118 27 23; T11, 120 25 36; T12, 122 23 49. Readback. Over.

04 16 46 14 LMP (TRANQ)

Roger. T8, 114 30 57; T9, 116 29 10; T10, 118 27 23; T11, 120 25 36; T12, 122 23 49. Over.

04 16 46 45 CC

Readback correct. Houston out.

END OF TAPE

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04 16 47 26 CMP (COLUMBIA)
Houston. Columbia.

04 16 47 49 CMP (COLUMBIA)
Houston, Columbia on high gain.

04 16 47 50 CDR (TRANQ)
Houston, Tranquility Base.

04 16 47 54 CC
Columbia. Columbia, this is Houston. Over.

04 16 48 04 CMP (COLUMBIA)
Columbia in the high gain.

04 16 48 06 CC
Roger. Reading you loud and clear on the high gain, Columbia.

04 16 48 13 CMP (COLUMBIA)
Roger. Going to P52 attitude. You want a crew status report?

04 16 48 21 CC
Say again, Columbia?

04 16 48 27 CMP (COLUMBIA)
I say again, I am maneuvering to the P52 attitude, and do you want a crew status report?

04 16 48 34 CC
Roger. And go ahead with your crew status report.

04 16 48 40 CMP (COLUMBIA)
Roger. No medication. Radiation 100.16.

04 16 48 46 CC
Houston. We copy.

04 16 49 15 CDR (TRANQ)
Houston, Tranquility Base.

04 16 49 17 CC
Go ahead, Tranquility.

04 16 49 23 CDR (TRANQ)
Roger. The weight of the RCU was 12 ounces. That was by itself without the bag, and the weight of the water from the CDR's PLSS was 12 1/2 ounces. That's reading zero with the bag on.

04 16 49 53 CC
This is Houston. We copy. And, for your information, the new LM weight after jettison of equipment including lithium hydroxide canister is 10837. Over.

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04 16 50 11 CDR (TRANQ)
Okay. 10837.

04 16 53 16 CMP (COLUMBIA)

Houston, Columbia. Did you copy the P52?

04 16 53 30 CC

Columbia, this is Houston. Affirmative.

04 16 53 39 CMP (COLUMBIA)

Okay.

04 16 55 05 CC

Tranquility Base, this is Houston. In the flight plan configuration, we show that the stability control circuit breaker ATCA on panel 16 should be open at this time. Over.

04 16 55 49 LMP (TRANQ)

Houston, Tranquility. Say again which one should be closed?

04 16 55 54 CC

Roger. Panel 16, row 2, STAB control ATCA, that is A T C A, and it should be open at this time. Over.

04 16 56 06 LMP (TRANQ)

Roger. Coming open.

04 16 56 12 CC

Roger. Out.

04 16 56 28 LMP (TRANQ)

Housquin - Houston, Tranquility. Do you have a way of showing the configuration of the engine arm circuit breaker? Over. The reason I'm asking is because the end of it appears to be broken off. I think we can push it back in again. I'm not sure we could pull it out if we pushed it in, though. Over.

04 16 56 56 CC

Roger. We copy. Stand by please.

04 16 57 21 CC

Tranquility Base, this is Houston. Our telemetry shows the engine arm circuit breaker in the OPEN position at the present time. We want you to leave it open until it is nominally scheduled to be pushed in, which is later on. Over.

04 16 57 41 LMP (TRANQ)

Roger. Copy.

04 16 59 39 CDR (TRANQ)

Houston, Tranquility Base. The CDR's PRD reads 11014.

04 16 59 51 CC

Roger. 11014 for the CDR.

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04 17 00 01 LMP (TRANQ)

Roger. LMP reads 09018. Over.

04 17 00 06 CC

Roger. 09018.

04 17 04 39 CMP (COLUMBIA)

Houston, Columbia. Over.

04 17 04 43 CC

Columbia, this is Houston. Go ahead.

04 17 04 48 CMP (COLUMBIA)

Roger, Bruce. When you get a few minutes could you give me some words on tomorrow's activities - when they're going to start?

04 17 04 57 CC

Roger.

04 17 11 45 CC

Columbia, Columbia, this is Houston. Over.

04 17 11 57 CC

Columbia, this is Houston. Over.

04 17 12 03 CMP (COLUMBIA)

Go ahead.

04 17 12 05 CC

Roger, Mike. Couple of quick flight plan update here. First off, we'd like to get an O2 fuel cell purge at time 113 30. You - Are you copying? Over.

04 17 12 23 CMP (COLUMBIA)

Roger. And copy.

04 17 12 26 CC

Secondly, we will return to the nominal timeline with your scheduled wakeup of 121 hours and 12 minutes. We sort of slipped by lithium hydroxide canister change number 9 during the EVA and EVA PREP. We'd like you to accomplish that now. The COMM for sleep will be the normal lunar COMM configuration, the RCS configuration. We're requesting you use quads Alfa and Bravo. A DAP data load for R2 should be 01111. Readback. Over.

04 17 13 28 CMP (COLUMBIA)

Roger. Oxygen fuel cell purge at 113 30. Return to the nominal timeline at 121 hours wakeup. Lithium hydroxide change number 9 right now. Normal lunar COMM sleep configuration, I'm in that now. On the RCS, I understood before you wanted to load the DAP register 2 011000 which made sense, and then later to pitch only

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on quad A, enable all on quad B, and C and D off. But you don't want to do that any more, huh?

04 17 15 20 CC

Columbia. This is Houston. On your DAP load in R2, we're requesting a 0 an four 1's, that is, 01111. Over

04 17 15 34 CMP (COLUMBIA)

Okay.

04 17 15 38 CC

And you - -

04 17 15 39 CMP (COLUMBIA)

Load's going in right now.

04 17 15 41 CC

Roger. And you'll be enabling quads Alfa and Bravo on the AUTO RCS select switches. Disable Charlie and Delta.

04 17 15 51 CMP (COLUMBIA)

All right.

04 17 15 59 CC

And we have a little less than 2 minutes to LOS. If you're still up, AOS next time around will be 114 04. Over.

04 17 16 18 CMP (COLUMBIA)

Roger.

04 17 16 27 CC

And, Columbia, if it's agreeable with you, we'd like you to stay awake until we have one successful reacquisition on the high gain antenna. And I guess you can plan on turning in shortly after AOS this next pass. Over.

04 17 16 47 CMP (COLUMBIA)

Okay.

04 17 16 49 CC

Roger. Out.

04 17 17 34 CC

Tranquility Base, Tranquility Base, this is Houston. Radio check. Over.

04 17 17 42 CDR (TRANQ)

Go ahead. Houston.

04 17 17 44 CC

Roger. Reading you loud and clear. Just wanted to make sure we still had COMM.

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04 17 17 52 CDR (TRANQ)

Roger. We just finished up - we're just finishing up our eat period. Be ready to go back into PREP for DEPRESS.

04 17 17 59 CC

Roger.

04 17 39 -- BEGIN LUNAR REV 20

04 17 46 23 CC

Tranquility Base, this is Houston. Over.

04 17 46 29 CDR (TRANQ)

Roger. Go ahead, Houston.

04 17 46 32 CC

Roger. On your next depressurization, it's acceptable to use the overhead hatch dump valve in addition to or instead of the forward hatch dump valve to speed up the depressurization of the cabin. I have a T13 update for you, and if you could, sometime here, give us P00 and DATA; we'll uplink you a new CSM state vector. Over.

04 17 47 04 CDR (TRANQ)

All right.

04 17 47 19 LMP (TRANQ)

You've got the DSKY.

04 17 47 22 CC

Roger. Your T13 time is 124 22 02. Over.

04 17 47 40 LMP (TRANQ)

Roger. It's T13, 124 22 - is that 02? Over.

04 17 47 49 CC

That's affirmative. That is 02. And do you have a time estimate for us until you're ready to start cabin DEPRESS? Over.

04 17 48 05 CDR (TRANQ)

Fifteen minutes, maybe?

04 17 48 10 CC

Roger.

04 17 50 30 CC

Tranquility Base, this is Houston. Uplink complete. The computer's yours, and you can go out of DATA.

04 17 50 39 CDR (TRANQ)

Roger.

04 17 59 50 CC

Tranquility Base, Houston.

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04 17 59 59 CDR (TRANQ)

Go ahead. Tranquility Base, here.

04 18 00 02 CC

Roger. Just want to let you guys know that since you're an hour and a half over your timeline and we're all taking a day off tomorrow, we're going to leave you. See you later.

04 18 00 13 CDR (TRANQ)

I don't blame you a bit.

04 18 00 16 CC

That's a real great day, guys. I really enjoyed it.

04 18 00 23 CDR (TRANQ)

Thank you. You couldn't have enjoyed it as much as we did.

04 18 00 26 CC

Roger.

04 18 00 28 LMP (TRANQ)

It was great.

04 18 00 30 CC

Sure wish you'd hurry up and get that trash out out of there, though.

04 18 00 34 CDR (TRANQ)

Yes. We're just about to do it.

04 18 00 36 CC

Okay.

04 18 03 34 CC

Tranquility Base, this is Houston. We show the suit relief valve still in the AUTO position. It should be closed. Over.

04 18 05 19 CC

Columbia, this is Houston. Over.

04 18 05 33 CMP (COLUMBIA)

Houston, Columbia. Go ahead.

04 18 05 35 CC

Roger. We've successfully reacquired high gain antenna. Unless you have some other traffic with us, I guess we'll bid you a good night and let you get some sleep, Mike. Over.

04 18 05 48 CMP (COLUMBIA)

Okay. Sounds fine.

04 18 05 50 CC

And we're going to power down the voice subcarrier part of our uplink to you in order that we don't disturb you while we're talking to Tranquility Base. If you need us, just give us

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a call, and we can respond with a time lag of about a minute to a minute and a half in setting reconfigured. Over.

04 18 06 13 CMP (COLUMBIA)

Okay. Thank you.

04 18 06 15 CC

Roger. And good night.

04 18 06 20 CMP (COLUMBIA)

Good night, Bruce. Thanks a lot.

04 18 09 23 CC

Columbia, Columbia, this is Houston. We'd like you to ENABLE the thrusters in Bravo 1 and Bravo 2, AUTO RCS SELECT. Over.

04 18 09 46 CMP (COLUMBIA)

Okay. Bravo 1 and Bravo 2 ENABLE.

04 18 09 49 CC

Roger. Out.

04 18 10 18 CC

Tranquility, this is Houston. For a reference, which dump valve are you using? Over.

04 18 10 28 CDR (TRANQ)

We used the forward dump valve until about 2 psi, and we're using the overhead now.

04 18 10 34 CC

Roger. Out.

04 18 10 37 CDR (TRANQ)

They're both - they're both open now.

04 18 18 27 CDR (TRANQ)

Houston, Tranquility Base. REPRESS complete.

04 18 18 31 CC

Roger, Tranquility. We observed your equipment jettison on the TV, and the passive seismic experiment recorded shocks when each PLSS hit the surface. Over.

04 18 18 47 CDR (TRANQ)

You can't get away with anything anymore, can you?

(GOSS NET 1)

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

04 18 18 51 CC

No, indeed.

END OF TAPE

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04 18 21 28 CC

Tranquility Base, this is Houston. Over.

04 18 21 34 CDR (TRANQ)

Go ahead, Houston.

04 18 21 36 CC

Roger. When you get back into your surface checklist and come over to the COMM reconfiguration on page Surface 45, we'd like you to enable the ranging feature on your S band. That is, when you come down to S band configuration, instead of CAUTION and WARNING ELECTRONICS, ENABLE TV, we'd like you to go into the RANGE position and leave it there for as long as you conveniently can until you get ready to commence your rest period; and we'll try to get a little more ranging data on you. Over.

04 18 22 20 CDR (TRANQ)

Roger. Copy.

04 18 22 23 CC

And of course, when you get ready to turn in, go back into caution and warning, ENABLE, and we'd like to say from all of us down here in Houston and really from all of us in all the countries and in the entire world, we think that you've done a magnificent job up there today. Over.

04 18 22 46 CDR (TRANQ)

Thank you very much.

04 18 22 48 LMP (TRANQ)

It's been a long day.

04 18 22 51 CC

Yes, indeed. Get some rest there and have at it tomorrow.

04 18 24 06 LMP (TRANQ)

Houston, Tranquility. Did you all come up with any other solution that we might try to the mission timer problem? Over.

04 18 24 27 CC

Stand by, Tranquility. We'll be back with you in just a minute.

04 18 25 29 LMP (TRANQ)

And, Houston, Tranquility. Have you had enough TV for today?

04 18 25 34 CC

Tranquility, this is Houston. Yes, indeed. It's been a mighty fine presentation there.

04 18 25 43 LMP (TRANQ)

Okay. Signing off. See you again tomorrow.

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04 18 25 46 CC

Roger.

04 18 26 53 CC

Columbia, Columbia, this is Houston. Over.

04 18 27 00 CMP (COLUMBIA)

Go ahead, Houston.

04 18 27 02 CC

Roger. Sorry to bother you, Columbia. Two things: we request that you select 10 degree deadband in your DAP in accordance with the procedures on Foxtrot 9 7 in your checklist; and secondly, we'd like to leave a display on the DSKY that is not one that's cycling, being continuously updated. What you have when you get through widening the deadband will be a static display, and that'll be satisfactory. Over.

04 18 27 41 CMP (COLUMBIA)

Okay.

04 18 27 42 CC

Roger. Goodnight again.

04 18 28 09 CC

Tranquility Base, this is Houston. Over.

04 18 28 16 LMP (TRANQ)

Roger. Go ahead.

04 18 28 19 CC

Roger. On your mission timer, we wanted to pull the circuit breaker and let it cool down for an hour and a half to 2 hours. I believe the breaker is currently open. It has been off, so go ahead and reset the mission timer circuit breaker. Put the timer control to RESET and hold it in RESET for 30 seconds, and then slew it to your desired settings left to right, and place the timer control to START. Over.

04 18 29 04 LMP (TRANQ)

Okay. We'll try it.

04 18 29 55 CDR (TRANQ)

Houston, our mission timer seems to be slewing okay. You want to give us a time hack? Or can we get it off the CMC LGC, I mean?

04 18 30 23 CC

Roger, Tranquility. I'll give you a time hack at 114 31 00. It's about 30 seconds from now. Over.

04 18 30 51 CC

Stand by for a Mark at 114 31.

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04 18 30 52 LMP (TRANQ)

Okay. ... you.

04 18 30 57 CC

Stand by.

04 18 31 00 CC

MARK.

04 18 31 14 CC

Tranquility, this is Houston. Did you copy my Mark at 114 31?

04 18 31 22 CDR (TRANQ)

Roger. Thank you, and our mission timer is running now.

04 18 31 27 CC

Roger. Very good. And, I've got a consumables update for you if you're ready to copy or listen. Over.

04 18 31 38 LMP (TRANQ)

Stand by.

04 18 31 43 LMP (TRANQ)

Okay. Go ahead.

04 18 31 45 CC

Okay. RCS Alfa is 81 percent, RCS Bravo 75 percent. Coming up on 115 hours GET, descent oxygen is 31.8 pounds or 59 percent; descent amp hours 858, and ascent amp hours 574. Over.

04 18 32 28 LMP (TRANQ)

Roger. Copy. Thank you very much.

04 18 32 32 CC

Roger. Out.

04 18 33 06 CC

Tranquility, this is Houston. We also have a set of about 10 questions relating to observations you made, things you may have seen during the EVA. You can either discuss a little later on this evening or sometime later in the mission at your option. How do you feel? Over.

04 18 33 35 CDR (TRANQ)

I guess we can take them up now.

04 18 33 39 CC

Okay. And your friendly Green Team here has pretty well been relieved by your friendly Maroon Team, and I'll put Owen on with the questions.

04 18 33 52 CC

Tranquility - -

04 18 33 53 CDR (TRANQ)

Okay. Thank you, Bruce. Go ahead.

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04 18 33 59 CC

Tranquility, Houston. First question here is how your best estimate of the yaw on the - of the LM as compared to the nominal preflight plan. Over.

04 18 34 16 LMP (TRANQ)

We got 13 degrees left on the ball, and I think that's probably about right. Looking at the shadow and so on, we prob - probably about 13 degrees left of the shadow.

04 18 34 31 CC

Roger. That's 13 degrees left of the shadow. And, next question relates to the depth of the bulk sampling that you obtained near the first part of the EVA and any changes in composition that you might have observed during the bulk sampling interval. Over.

04 18 35 02 CDR (TRANQ)

I'm not sure I understand that question, but we got a good bit of the ground mass in the bulk sample plus a sizable number of selected rock fragments of different types.

04 18 35 22 CC

Roger, Neil. One of the implications here is the depth from which the bulk sample was collected. Did you manage to get down there several inches or nearer the surface? Over.

04 18 35 37 CDR (TRANQ)

We got some down from as much as 3 inches in the area where I was looking at variation with depth in the bulk sample. There really wasn't appreciable difference, and I didn't run into any hard bed. Later on, or at some other times and other areas, why, I'd get down just a short distance, an inch or two, and couldn't go any further.

04 18 36 06 CC

Roger. Believe we understand down as deep as 3 inches, did not hit any hard bed, and no significant changes in composition to that depth. Next question, the - the second SRC was packed rather hurriedly due to the time limitation, and wonder if you would be able to provide any more detailed description of the samples which were included in the second SRC. Over.

04 18 36 40 CDR (TRANQ)

We got two core tubes and solar wind and about half of the big sample bag full of assorted rocks which I picked up hurriedly from around the area. I tried to get as many representative types as I could.

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04 18 37 09 CC

Roger, Neil. Next topic here relates to the rays which emanate from the DPS engine burning area. We're wondering if the rays emanating from the - beneath the engine are any darker or lighter than the surrounding surface. Over.

04 18 37 42 LMP (TRANQ)

The ones that I saw back in the aft end of the spacecraft appeared to be a good bit darker; of course, viewed from the aft end, why, they did have the Sun shining directly on them. It seemed as though the material had been baked somewhat and also scattered in a radially outward direction, but in that particular area, this feature didn't extend more than about 2, maybe 3 feet, from the skirt of the engine. Over.

04 18 38 24 CC

Roger. Understand that near the aft end out to the east that the rays did appear darker. I understand, Buzz, that these were - this was the appearance of the material which had been uncovered by the rays that appeared darker for 2 or 3 feet extending outward. Is that correct?

04 18 38 49 LMP (TRANQ)

No. I wouldn't say it was necessarily material that had been uncovered. I think some of the material might have been baked or in some way caused to be more cohesive and perhaps flow together in some way, I don't know. Now, in other areas, before we started trampling around out front, why, we could see that small erosion had taken place in a radially outward direction, but it had left no significant mark on the surface other than just having eroded it away. Now, it was different back in the - right under the skirt itself. It seems as though the surface had been baked in a streak fashion, and I think a couple of pictures on film will show this. But that didn't extend out very far. Over.

04 18 39 48 CC

Roger, Tranquility. And this baked appearance that you described, at least the suggestion is that it was due to the heat of the engine at any rate. Next subject, did -

04 18 40 01 LMP (TRANQ)

I believe so.

04 18 40 02 CC

Roger. Next subject, did either of the solar panels on the PSE touch the surface of the Moon during deployment? Over.

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04 18 40 19 LMP (TRANQ)

I think that two corners did touch, since when it was deployed, both of them didn't come out at the same time. It unfolded a little unevenly, and of course, the terrain that it was on was a little bit - not quite as level as it was - as I would like to have it. And I think that two corners did touch to about 1 inch - no, three quarters to a half an inch deep; and maybe along the bottom, it might have been maybe 3 inches, leaving a small triangular coating on two of the corners; and I think these are on the western ones. Over.

04 18 41 06 CC

Roger. Understand the description there. And the next subject, on the two core tubes which you collected, how did the driving force required to collect these tubes compare? Was there any difference? Over

04 18 41 27 LMP (TRANQ)

Not significantly. I could get down to about the first 2 inches without much of a problem, and then as I would pound it in about as hard as I could do it, and the second one took two hands on the hammer, and I was putting pretty good dents in the top of the extension rod, and it just wouldn't go much more than - I think the total depth might have been about 8 or 9 inches. But even there, it didn't - For some reason it didn't seem to want to stand up straight. In other words, I'd keep driving it in and it would dig some sort of a hole but it wouldn't - just penetrate in a way that would support it and keep it from falling over, if that makes any sense at all. It didn't really to me. Over.

04 18 42 22 CC

Roger, Buzz. I think I've got the picture. You indicate that little difference between the two samples and that in each case you got down about 2 inches without any problems and then had to continue hammering rather vigorously in order to continue driving it in to a total depth of 8 or 9 inches, and even at that point the rods did not want to stay vertical, that they'd tend to fall over on you even after pounding in that far. Is that correct?

04 18 42 59 LMP (TRANQ)

Yes. That's about it. It wasn't a rapid change in resistive force. And also I noticed when I took the bit off that the material was quite well packed, a good bit darker, and it - The way it adhered to the core tube gave me the distinct impression of being moist. Over.

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04 18 43 23 CC

Roger. Understand the general impression of being moist as it packed in the core tube. Next question: we did copy your comments prior to the EVA of your general description of the area. We wonder if either of you would have any more lengthy description or more detailed description of the general summary of the geology of the area. Over.

04 18 44 01 LMP (TRANQ)

Yes let's - we'll - We'll postpone our answer to that one until tomorrow. Okay?

04 18 44 08 CC

Yes, indeed. That'll be fine. Just a couple more here, and I think these may not be quite as lengthy as number 7 there. Can you estimate the stroke of the primary and secondary struts? Over.

04 18 44 31 CDR (TRANQ)

Well, I could do it like this, Owen. About all the struts are about equally stroked, and the height from the ground to the first step is about 3 feet or maybe 3 and 1/2 feet, huh?

04 18 44 52 CC

Roger. Understand, Neil. Next topic, as - just after landing, you pointed out that there was a hill to the west along the plus Z axis from the LM. Are there any large rocks in that direction that might block the solar ray during the sunset - as sunset approaches in your locality - Are there any large rocks that might tend to obscure the ray? Over.

04 18 45 32 LMP (TRANQ)

No. I don't believe so, I think that it's - It's about as level as any other areas that we chose.

04 18 45 46 CC

Roger. I - -

04 18 45 47 LMP (TRANQ)

There's nothing large, anyway, that's going to get in the way.

04 18 45 50 CC

Roger. Copy. That's also the way it appeared from the television, I think. And now the final question. You commented, Neil, that on your approach to the landing spot, you had passed over a football field sized crater containing rather large blocks of solid rock perhaps 10 to 15 feet in size. Can you estimate the distance to this football sized crater from your present position? Over.

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04 18 46 25 CDR (TRANQ)

I thought we'd be close enough so that when we got outside we could see its rim back there but I couldn't. But I don't think that we're more than a half mile beyond it. That is a half mile west of it.

04 18 46 45 CC

Roger. So you estimate your present position less than half a mile approximately west of this large crater. Over.

04 18 46 56 CDR (TRANQ)

That's correct.

04 18 46 58 CC

Okay. Well, that takes care of the questions from our geologists for tonight, and unless you have something else, that'll be all for - from us for the evening. Over.

04 18 47 12 LMP (TRANQ)

Okay. Thank you.

04 18 49 01 CC

Tranquility Base, Houston. We've now collected all the ranging data that we can use, and you can go back to caution and warning ENABLE. Over.

04 18 49 14 LMP (TRANQ)

Roger. Will do.

04 18 52 18 CC

Tranquility Base, Houston. Over.

04 18 52 27 LMP (TRANQ)

Go ahead, Houston.

04 18 52 28 CC

Roger. Two more verifications, here. Can you - will you verify that the disk with messages was placed on the surface as planned, and also that the items listed in the flight plan - all of those listed there were jettisoned. Over.

04 18 52 48 LMP (TRANQ)

That's - All that's verified.

04 18 52 51 CC

Roger. Thank you, and I hope this will be a final good night.

04 18 52 57 LMP (TRANQ)

Okay.

END OF TAPE

Tape 75/1 Page 431

04 19 37 -- BEGIN LUNAR REV 21

REST PERIOD - NO COMMUNICATIONS

Tape 76/1 Page 432

04 21 36 -- BEGIN LUNAR REV 22

REST PERIOD - NO COMMUNICATIONS

Tape 77/1 Page 433

04 23 33 -- BEGIN LUNAR REV 23

REST PERIOD - NO COMMUNICATIONS

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05 00 59 04 CC

Columbia, Columbia, good morning from Houston.

05 00 59 12 CMP (COLUMBIA)

Hi, Ron.

05 00 59 14 CC

Hey, Mike, how's it going this morning?

05 00 59 17 CMP (COLUMBIA)

How goes it?

05 00 59 18 CC

Hey, real fine. While you're - -

05 00 59 20 CMP (COLUMBIA)

I don't know yet, how's it going with you?

05 00 59 23 CC

Real fine here. Columbia, request P00 and ACCEPT. We'll shove the state vector in for you right away.

05 00 59 57 CC

Okay. It's coming up now, Columbia. We're going to keep you a little busy here. As soon as we get the state vector in, we'd like you to go ahead and do a P52 option 3 on this night pass, and then when you come on around the other side there, we'll give you some landmark tracking information on prime 130.

05 01 00 29 CMP (COLUMBIA)

Okay.

05 01 00 34 CC

And for your information, we're also going to have Tranquility Base do a P52 when you come around the other time; and I have the P22 information if you're ready to copy.

05 01 00 54 CMP (COLUMBIA)

Go ahead.

05 01 00 56 CC

Okay. Track landmark 130 prime using P22, and for information, this will properly position your rendezvous radar transponder. T1 is 122 plus 16 plus 05 - whoops, okay. Stand by.

05 01 02 04 CC

Columbia, Houston. The computer is yours.

05 01 02 12 CMP (COLUMBIA)

Okay. And I'd like the grid square of this crater 130 prime. Over.

05 01 02 24 CC

Columbia, Houston. Say again about 130 prime.

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05 01 02 31 CMP (COLUMBIA)

I'd like its grid square, please.

05 01 02 35 CC

Roger. Stand by.

05 01 04 58 CC

Columbia, Houston.

05 01 05 08 CMP (COLUMBIA)

Go ahead.

05 01 05 09 CC

Roger. I have the T1 and T2 times and also the longitude of the 130 prime. We're working on the grid squares and we'll get them shortly.

05 01 05 26 CMP (COLUMBIA)

Okay. Ready to copy.

05 01 05 28 CC

Okay. T1: 122 plus 16 plus 05. Tango 2 is 122 plus 21 plus 11, and 6 miles north of track. And do you want your NOUN 89 values?

05 01 05 58 CMP (COLUMBIA)

Yes, please.

05 01 06 00 CC

Roger. Latitudes, plus 01.243. Longitude over 2, plus 11.844. Altitude, minus 001.46. Over.

05 01 06 32 CMP (COLUMBIA)

Copy T1: 122 16 05. T2: 122 21 11, 6 miles north, NOUN 89 is plus 01243, plus 11844, minus 00146.

05 01 06 51 CC

Columbia, affirmative. And at the T1 time, put your rendezvous radar transponder switch to OPERATE.

05 01 07 05 CMP (COLUMBIA)

All right.

05 01 07 06 CC

And this 130 prime is the same one that you tracked prior to descent. Over.

05 01 07 23 CMP (COLUMBIA)

Okay. You've updated your information as to the LM's position and this is your best estimate of where the LM is, is that correct?

05 01 07 37 CC

Columbia, that's negative. This 130 is the little bitty crater there that you tracked - John Young's crater - that you tracked prior to descent. And we want that - -

05 01 07 50 CMP (COLUMBIA)

Fine. Okay. You've given up looking for that.

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05 01 07 53 CC

Affirmative. We want this for one last fix on your plane.

05 01 08 00 CMP (COLUMBIA)

All right. Fine. Understand. Thank you.

05 01 08 05 CC

And when the LM does his P22 on your transponder, well then, that'll be our last shot at the LM's position.

05 01 08 14 CMP (COLUMBIA)

Roger. Understand. Do you care whether my transponder is on before T1?

05 01 08 35 CC

Roger. It'll be on WARMUP prior to that time, and you can go to OPERATE anywhere around that time.

05 01 08 44 CMP (COLUMBIA)

Yes. I gather it's on its 24 minute warmup now?

05 01 08 47 CC

Roger.

05 01 08 53 CC

And, Houston. The computer is yours, you can go to BLOCK anytime.

05 01 08 59 CMP (COLUMBIA)

Roger. BLOCK, going P52, option 3.

05 01 09 02 CC

Roger. And we'll see you coming around the other side. About 1 minute to go, and all your systems are looking good.

05 01 09 11 CMP (COLUMBIA)

Thanks, Ron.

05 01 32 -- BEGIN LUNAR REV 24

05 01 40 36 CC

Tranquility Base, Tranquility Base, Houston. Over.

05 01 40 45 CDR (TRANQ)

Good morning, Houston. Tranquility Base. Over.

05 01 40 49 CC

Roger. Loud and clear. And how is the resting standing up there. Did you get a chance to curl up on the engine can?

05 01 41 02 LMP (TRANQ)

Roger. Neil has rigged himself a really good hammock with a waste tether, and he's been lying

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on the ascent engine cover, and I curled up on the floor. Over.

05 01 41 14 CC

Roger. Copy, Buzz. Got a couple of changes to your surface checklist here, and in general, what we're going to want you to do is P22, tracking the command module for one last hack on your position there. And this will be - in other words, P57, P22, and then to press on with the checklist, and the rest of them are a couple of minor changes in the checklist. The main one being that we do not want the rendezvous radar on during the ascent, and we think that this will take care of some of the overflow of program alarms which we're getting during descent.

05 01 42 05 CDR (TRANQ)

Okay. We had the rendezvous radar in SLEW during descent, though.

05 01 42 14 CC

Tranquility Base, Houston. I missed that. Say again.

05 01 42 21 CDR (TRANQ)

Roger. I say again. We had the rendezvous radar switch in the SLEW position, not the LGC position.

05 01 42 33 CC

Roger. We copy that. But there's a greater duty cycle on - There's a good 15 percent duty cycle on the ascent program there, so just go ahead and leave it off. And I have the changes there if you want to get out your surface checklist, and I can go ahead and start giving them to you.

05 01 42 59 CDR (TRANQ)

All right. Go ahead. I've got it out.

05 01 43 01 CC

Okay. Before we start here, request P00 and DATA, and we'll give you some vectors.

05 01 43 23 CDR (TRANQ)

Now you've got P00 and DATA.

05 01 43 25 CC

Okay. And on Surface 50 will be the first change there.

05 01 43 35 CDR (TRANQ)

Okay. And I understand you want us to do a P57 option 3 and then a P22, is that the general idea? Over.

05 01 43 44 CC

That's affirmative. So on Surface 50 there, down at the bottom of the page, just after PRO after two recycles, stick in a time of 122 plus 15; do P22 as per PGNS 20 of G&N dictionary. Over.

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05 01 44 21 CDR (TRANQ)

Roger. Understand that's 122 15, do P22 as per PGNS 20, G&N dictionary.

05 01 44 29 CC

Roger. Okay. Let's skip on over to Surface 59.

05 01 44 50 CDR (TRANQ)

Okay.

05 01 44 51 CC

Okay. This is going to be for one last vent on the DPS tank there, so at the top of the page just after EPS INVERTER 1, CLOSE, add - Okay, after EPS INVERTER 1, CLOSE, add PROP DESCENT HELIUM REG/VENT CLOSE, and then after STABILIZATION/CONTROL AELD, CLOSE, add PROP DISPLAYS/ENGINE OVERRIDE/LOGIC, CLOSE. Over.

05 01 46 02 CDR (TRANQ)

Roger. Copy. These are two circuit breakers, right?

05 01 46 20 CC

Tranquility Base, affirmative. Those are just the circuit breakers at that time.

05 01 46 53 CC

Tranquility Base, Houston. Did you get those two on the propulsion circuit breakers?

05 01 47 02 CDR (TRANQ)

Roger. I have those two.

05 01 47 04 CC

Okay. Let's go over to Surface 60, and then down the middle of the page, after launch guidance system recommendation from MSFN, then I add the switches there.

05 01 47 37 CDR (TRANQ)

Roger. Go ahead then.

05 01 47 38 CC

Okay. After launch guidance system recommendation from MSFN, add DESCENT PROPULSION FUEL VENT, OPEN; add DESCENT PROPULSION OXIDIZER VENT, OPEN; add verify talkback gray. Over.

05 01 48 22 CDR (TRANQ)

Roger. DESCENT PROPELLANT FUEL VENT, OPEN; DESCENT PROPELLANT OXIDIZER VENT, OPEN; verify talkback gray.

05 01 48 29 CC

Roger. You got that one, so that'll be the last vent and it will continue venting. Skip over to Surface 61 down there at TIG minus 17.

05 01 49 10 CDR (TRANQ)

Roger. I'm there. Go ahead.

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05 01 49 12 CC

Okay, at TIG minus 17, delete CB (11). AC Bus A, RENDEZVOUS RADAR, CLOSE, wait 30 seconds; delete PGNS: RENDEZVOUS RADAR, CLOSE; and then add UP DATA LINK switch to VOICE BACKUP. Over

05 01 49 47 CDR (TRANQ)

Roger. I have that. We'll leave those two circuit breakers open, and have the UP DATA LINK to VOICE BACKUP; and we'll make the appropriate changes on the following circuit breaker status card.

05 01 50 01 CC

Roger. And then you might add a little note down there at the bottom of the page - Note: - This is at the bottom of page 61 - Note: Do not use tape meter in PGNS, i.e., do not place MODE SELECT switch to PGNS. Over.

05 01 50 35 CDR (TRANQ)

Okay. We'll put it in AGS.

05 01 50 40 CC

Roger. Fair enough. That's some more of that computer load business.

05 01 50 49 CC

Okay. That's all the changes we have for the checklist here. I've got some - just some general notes, I'll read to you on P22, and just for some information. Over.

05 01 51 08 CDR (TRANQ)

Okay. Then it looks to me like we ought to get hopping on this P57.

05 01 51 21 CC

Roger. We agree wholeheartedly. And while you're starting on that, I'll read - just read these notes on P22. Call P22 possible program alarm 5.6, range greater than 400 nautical miles, and then use the P22 as described on PGNS 20. Take option 1 in NOUN 06, and use the no update mode. The rendezvous radar will lock on at about 25 degrees elevation above the horizon. If 503 alarm occurs, designate fail. Key a PROCEED and allow the rendezvous radar to search for the CSM. And place the range altitude monitor switch in altitude/altitude rate to prevent the tape meter from driving into the stops. And press on.

05 01 52 29 CDR (TRANQ)

Roger. I think I have that.

05 01 58 18 CC

Columbia, Columbia, Houston. Over.

05 01 59 17 CC

Columbia, Columbia, Houston. Over.

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05 01 59 33 CMP (COLUMBIA)

Houston, Columbia.

05 01 59 35 CC

Roger, Columbia. We'd like a CRYO stir in all four tanks and the standard 1 minute. Over.

05 01 59 47 CMP (COLUMBIA)

In work.

05 01 59 48 CC

Roger. And do you have any torquing angles from the P52?

05 01 59 55 CMP (COLUMBIA)

Roger. Stand by one.

05 02 00 12 CC

Tranquility, Houston. Request ERROR RESET at this time. Over.

05 02 00 21 LMP (TRANQ)

Roger. ERROR RESET, and would you tell me when you're satisfied with the LGC self test?

05 02 00 30 CC

Tranquility, LGC is a GO.

05 02 00 36 LMP (TRANQ)

Roger.

05 02 00 39 CMP (COLUMBIA)

Torquing angles when you're ready.

05 02 00 41 CC

Columbia, Houston. Go ahead.

05 02 00 51 CMP (COLUMBIA)

Roger. Stars 25 and 42; angle difference 5 balls; NOUN 93, plus 00165, plus 00186, minus 00039, time of torquing 121 15. Over.

05 02 01 12 CC

Columbia, Houston. We copy. Thank you.

05 02 01 26 CMP (COLUMBIA)

And CRY0 stir complete.

05 02 01 29 CC

Roger. Thank you, Columbia.

05 02 05 35 LMP (TRANQ)

Houston, Tranquility. Would you like a recycle on the VERB 6 04? Over.

05 02 05 47 CC

Tranquility, Houston, We copy. Stand by one.

05 02 05 55 CC

Tranquility, Houston. Request recycle.

END OF TAPE

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05 02 11 43 CMP (COLUMBIA)

Houston, Columbia. My rendezvous radar transponder is operating.

05 02 11 52 CC

Spacecraft calling Houston? Say again.

05 02 11 57 CMP (COLUMBIA)

This is Columbia saying the rendezvous radar transponder is operating.

05 02 12 02 CC

Roger. Copy, Columbia.

05 02 13 56 CC

Tranquility, Houston. Request rendezvous radar breakers in about now.

05 02 14 33 CC

Columbia, Houston. Request OMNI D - OMNI Delta.

05 02 15 47 CC

Tranquility Base, Houston. Request you go ahead and start the warmup on the rendezvous radar.

05 02 15 56 LMP (TRANQ)

Roger.

05 02 16 58 CDR (TRANQ)

Houston, you copying NOUN 93?

05 02 17 01 CC

Tranquility, affirmative. Go.

05 02 17 07 CDR (TRANQ)

Roger. We're going to a torque.

05 02 17 10 CC

Houston. Roger.

05 02 18 00 CC

Tranquility Base, Houston. Columbia will be overhead at 122 plus 22 plus 51. His LOS will be 29 35. Over.

05 02 18 21 LMP (TRANQ)

Roger.

05 02 20 35 CDR (TRANQ)

Houston, we'd like to check this on the tape meter against the AGS. We'll go back to altitude - altitude rates as soon as the rate starts to build up. Over.

05 02 20 50 CC

Tranquility, Houston. Roger.

05 02 21 03 CDR (TRANQ)

On second thought, since that will peg the range rate, I guess maybe we'd better not do that. And

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for this range that the AGS are showing now, 425 miles with a signal strength of 2.2. It looks like we ought to proceed on this. Over.

05 02 21 31 CC
Roger. Stand by one. Tranquility, affirmative. Proceed.

05 02 21 56 LMP (TRANQ)
Are you getting the information on the downlink now?

05 02 22 04 CC
Tranquility, affirmative, and we're saving it. We've got 4 so far, and it's looking good.

05 02 22 18 CDR (TRANQ)
Okay. What do you people think about calling up a VERB 83?

05 02 22 41 CC
Tranquility, Houston. Stand by on that now. We're getting the data now. We're checking on the VERB 83.

05 02 22 50 LMP (TRANQ)
And we expect that we may lose lock when it passes overhead because of the MAX rate that the radar has.

05 02 23 05 CC
Tranquility, Houston. Negative on VERB 83.

05 02 23 11 LMP (TRANQ)
Understand.

05 02 24 09 CDR (TRANQ)
We just lost lock.

05 02 24 12 CC
Tranquility, Houston. Go.

05 02 24 23 CMP (COLUMBIA)
They've just lost lock, Ron.

05 02 24 25 CC
Roger. We had about 20 some points before you did that. And for your information, the reason the AGS is a little different there - The reason the AGS is a little different is because the K factor is a little bit wrong.

05 02 24 40 LMP (TRANQ)
Has he already gone? Over. Okay. Okay. Has he already gone overhead, or do you want us to try and get in lock on again?

05 02 24 51 CMP (COLUMBIA)
Houston, Columbia. You got NOUN 49. Five good marks.

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05 02 24 57 CC
Tranquility, affirmative. Try to lock on again, and you'll lose him at about 29 minutes and 35 seconds.

05 02 25 09 LMP (TRANQ)
Okay. Do you have a real quick procedure how to do that?

05 02 25 21 CC
Columbia, Houston. Say again about your NOUN 49.

05 02 25 28 CMP (COLUMBIA)
I say I got five good marks. You got NOUN 49. When you get everything you need off the downlink, let me know.

05 02 25 36 CC
Columbia, Houston. Stand by one.

05 02 25 56 CDR (TRANQ)

Ron, did you say on the 526 alarm to proceed or do a VERB 32?

05 02 26 03 CC

Roger. It's just that radar thinks the range is greater than 400 miles now.

05 02 26 13 CC

Tranquility Base, Houston. Recommend you terminate P22. Over.

05 02 26 22 CDR (TRANQ)

Roger. Will do.

05 02 26 24 CC

And, Columbia, Houston. Same for you. You can terminate P22.

05 02 26 34 CMP (COLUMBIA)

I have. I'm running fast.

05 02 26 36 CC

Roger.

05 02 27 14 CMP (COLUMBIA)

I'm staying in P22 here a second just to record the NOUN 89 and then over VERB 34.

05 02 27 21 CC

Columbia, Houston. Roger. We copy, and that's good.

05 02 27 57 CC

Tranquility, Houston.

05 02 28 07 LMP (TRANQ)

Roger. Go ahead.

05 02 28 09 CC

Roger. Request S BAND FUNCTION switch to RANGE. We're going to do some ranging on you. Also, I have an updated AGS K factor when you are ready to copy. Over.

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05 02 28 24 CDR (TRANQ)

Roger. Go ahead with the K factor.

05 02 28 27 CC

Roger. 119 plus 59 plus 59.92. Over.

05 02 28 44 CDR (TRANQ)

Roger. A little closer this time.

05 02 28 46 CC

Yes. It sure is.

05 02 28 47 LMP (TRANQ)

119 59 59.92. Over.

05 02 28 52 CC

Tranquility, Houston. Readback correct.

05 02 30 10 CC

Columbia, Houston - -

05 02 30 11 CDR (TRANQ)

Houston, Tranquility. I see what you mean now about the K factor.

05 02 30 15 CC

Roger.

05 02 30 23 CMP (COLUMBIA)

This is Columbia. Go ahead. And I'd like to know about this P52 coming up. Is that the one I just completed or do you want a pair of them back to back?

05 02 30 36 CC

Columbia, Houston. You do not need to do another P52 unless you want to. Break. And also, Columbia, when you get a chance, request BATT C and the PYRO readouts. Over.

05 02 31 08 CMP (COLUMBIA)

BATT C says 37 volts even. PYRO A, 37. PYRO B, 37.

05 02 31 20 CC

Columbia, Houston. Roger. We copy. Thank you.

05 02 31 28 CMP (COLUMBIA)

BATT bus B is 37. BATT bus A is 36, or I'd think the gauge is stuck.

05 02 31 35 CC

Roger. And you're looking good to us - to us, Columbia.

05 02 31 43 CMP (COLUMBIA)

Yes sir. Keep it that way.

05 02 32 06 CMP (COLUMBIA)

Columbia is coming up on a VERB 45 ENTER to reset the surface flag.

05 02 32 15 CC

Columbia, Houston. Negative. Stand by on the VErB 45.

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05 02 32 22 CMP (COLUMBIA)

Roger that.

05 02 32 43 CMP (COLUMBIA)

And a crew status report from Columbia. I figure I got about 5 hours' good sleep, although you guys probably know better than I do.

05 02 32 52 CC

Columbia. Roger. We copy.

05 02 33 31 CC

Columbia, Houston. We've got a couple more vectors to send up to you. They'll be coming up shortly and then you can do the VERB 45 after you get those in. Over.

05 02 33 44 CMP (COLUMBIA)

Okay. That's fine. Just wanted to make sure that we're both in SYNC on the order.

05 02 33 54 CC

Roger.

05 02 35 24 CC

Columbia and Tranquility Base, this is Houston. In case you haven't noticed, the MSFN relay is not activated, so I can go ahead and relay anything if you want to talk directly.

05 02 35 44 CMP (COLUMBIA)

Columbia. Roger.

05 02 35 54 CDR (TRANQ)

Houston, Tranquility. Be advised we've got - -

05 02 35 57 CMP (COLUMBIA)

...

05 02 36 01 CDR (TRANQ)

Coming ... on schedule - - showing red right now. We just put a VERB 77 in. I believe that there's ... let me check here.

05 02 36 20 CC

Tranquility Base, Houston. We've got a lot of static down here. Could you say again?

05 02 36 31 CDR (TRANQ)

Roger. We have four out of eight circuit breaker talkbacks indicating red. We still have the circuit breakers out as of right now. I believe at this moment we have just entered VERB 77 on tape 3052 and are ready to proceed with the hot fire. Is it normal to have these four red flags? Over.

05 02 37 09 CC

Tranquility Base, Houston. We think that's okay. Go ahead and reset them and press on with the hot fire. Over.

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05 02 37 28 CC

Roger. They are reset.

05 02 37 33 CC

Columbia, Columbia, Houston. Request P00 and ACCEPT, and we'll send some state vectors up to you.

05 02 37 44 CMP (COLUMBIA)

Here we going P00 and ACCEPT.

05 02 41 58 CDR (TRANQ)

Houston, Tranquility. I used Capella in the last sighting, and it's a good ways near the edge. A good ways away from the center of detent 4. I'm wondering if it would pay any to use Alpheratz, star number 1. It might be a little closer. However, it would delay things a little, since I'd have to designate the radar out of the way. Over.

05 02 42 36 CC

Tranquility. Roger. We copy. Stand by 1. And, break, break, Columbia. We're having a little trouble getting the stuff in there. Request high gain, pitch minus 20, yaw plus 150. Over.

05 02 43 06 CC

And, Tranquility, Houston. We'd prefer to save the time; press on with Capella. Over.

05 02 43 19 CDR (TRANQ)

Roger.

05 02 43 30 CC

And, Tranquility, Houston. The RCS check looked mighty fine to us.

05 02 43 37 CDR (TRANQ)

It looks good up here.

05 02 43 48 CC

Columbia, Columbia, Houston. Over.

05 02 44 22 CC

Columbia, Houston. Over.

05 02 44 57 CC

Columbia, Houston in the blind - high gain. Pitch minus 20, yaw plus 150.

05 02 45 52 LMP (TRANQ)

Houston, Tranquility. Could you give me the fixed portion of the ascent PAD so I can load it in for a P57? Over.

05 02 46 02 CC

Tranquility. Roger. Stand by one. We want to wait on that P57 until about TIG minus 50 minutes. Over.

05 02 46 19 LMP (TRANQ)

Roger.

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05 02 47 03 CC

Columbia, Columbia, Houston. Over.

05 02 48 30 CC

Columbia, Columbia, Houston. Over.

05 02 50 24 LMP (TRANQ)

Houston, Tranquility. It turns out that detent 4 isn't usable anyway with the yaw that we have, because the Earth appears in both detent 2 and detent 3.

05 02 50 39 CC

Tranquility Base, Houston. Roger.

05 02 50 54 CC

Columbia, Houston. Over.

05 02 51 22 CC

Tranquility, Houston. I have your LM ascent and CSI data PAD's when you are ready to copy.

05 02 51 33 CDR (TRANQ)

We're ready to copy.

05 02 51 36 CC

Roger. LM ascent PAD: TIG 124 22 00 00 00 NOUN 76 55349 00322, plus 0017; DEDA 47, plus 37104, minus 70470, plus 58604, plus 56936. Your LM weight 10837. Your T14 126, plus 20, plus 12. Over.

05 02 53 18 CDR (TRANQ)

What figure is the crossrange and NOUN 76?

05 02 53 26 CC

Roger. Your crossrange for NOUN 76 - By the way, we may update this later, but now it is plus 0017. Over.

05 02 53 47 CDR (TRANQ)

Roger. Readback follows. TIG 124 22 0000 55349 00322, plus 0017, plus 37104, minus 70470, plus 58604, plus 56936. LM weight 10837. T14, 126 20 12. Go.

05 02 54 30 CC

Tranquility, Houston. Roger. Your readback correct. Now I have your CSI PAD.

05 02 54 50 CDR (TRANQ)
Going to CSI PAD.

05 02 54 52 CC
Roger. CSI PAD. TIG of CSI 125 19 3470; TIG of TPI 126 57 0000; NOUN 81, 0532 plus 0000; FDAI NA; DEDA 373 03196; DEDA 275 04170; NOUN 86 plus 0532, plus 0000, plus 0012. Tranquility readback.

Tape 79/8 Page 448

05 02 56 21 CDR (TRANQ)
CSI Apollo PAD follows. TIG 125 19 3470; TIG of TPI 126 57 0000; NOUN 81, 0532, plus all zeroes, 373 03196 275 04170; NOUN 86 plus 0532, plus 0000, plus 0012. Go.

05 02 57 10 CC
Tranquility Base, Houston. Your readback is correct. And, Tranquility, no need for any GYRO compensation. It's GO.

05 02 57 26 LMP (TRANQ)
Roger. Understand.

05 02 57 34 CC
Columbia, Houston. Over.

05 02 57 48 CC
Columbia, Houston in the blind. Request high gain. Pitch minus 30, yaw plus 170. Over.

05 02 58 35 CMP (COLUMBIA)
Houston, Columbia on the high gain. Over.

05 02 58 38 CC
Roger, Columbia. We still need to finish your uplink there, and then I have your CSI and TPI times and also the lift off.

05 02 58 53 CMP (COLUMBIA)
Go ahead. Ready to copy.

05 02 58 57 CC
Roger. LM ascent lift off time: 124 22 0000. Your CSI TIG, say again CSI TIG: 125 19 3470. Your TIG of TPI: 126 57 0000. And the LM's NOUN 81 values for CSI: 0532 - that's 53.2 for DELTA VX, DELTA VY all zeros. Columbia, Houston. Over.

05 03 00 12 CMP (COLUMBIA)
Roger. I readback lift off TIG 124 22 even, CSI 125 19 3470, TPI 126 57 even, the LM's NOUN 81 for CSI 53.2 DELTA VX. Over.

05 03 00 35 CC
Columbia, Houston. Roger. Your readback correct.

05 03 01 00 CC
Columbia, Houston. We're coming up with your second load now.

05 03 01 12 CMP (COLUMBIA)
Roger that.

05 03 01 49 CC
Columbia, Houston. The computer is yours, and you can do your VERB 45 ENTER now.

05 03 01 58 CMP (COLUMBIA)
Roger. Go into BLOCK and VERB 45 ENTER.

Tape 79/9 Page 449

05 03 02 02 CC

Roger.

05 03 02 11 CMP (COLUMBIA)

How's the Black Team today? All primed and raring to go?

05 03 02 14 CC

You bet you there, Mike.

05 03 02 20 CMP (COLUMBIA)

Good signal.

05 03 05 43 CC

Columbia, Houston. About 3 minutes to LOS, and I have your consumables update.

05 03 05 52 CMP (COLUMBIA)

Ready to copy.

05 03 05 53 CC

Roger. At 123 plus 00, RCS total minus 7 percent, Alfa minus 12 percent, Bravo plus 4.5, Charlie minus 7, Delta minus 6.5. Your hydrogen total minus 1.4 pounds, oxygen - oxygen plus 1.7. Over.

05 03 06 40 CMP (COLUMBIA)

Whoever figured those hydrogens and oxygens out a couple of days ago must have known what he was doing.

05 03 06 46 CC

Okay. I think I read that oxygen - it's a plus 17 pounds.

05 03 06 54 CMP (COLUMBIA)

Roger. Still close.

05 03 06 56 CC

Roger.

05 03 07 52 CC

Eagle and Columbia, this is the backup crew. Our congratulations for yesterday's performance, and our prayers are with you for the rendezvous. Over.

05 03 08 04 CDR (TRANQ)

Thank you, Jim.

05 03 08 06 LMP (TRANQ)

Thank you, Jim.

05 03 08 10 CMP (COLUMBIA)

Glad to have all you big room full of people looking over our shoulder.

05 03 08 15 CDR (TRANQ)

We had a lot of help down there, Jim.

Tape 79/10 Page 450

05 03 10 32 CDR (TRANQ)

And, Houston, Tranquility Base is going to give you a few comments with regard to the geology question of last night. We are landed in a relatively smooth crater field of elongate secondary - circular secondary craters, most of which have rims irrespective of their - raised rims irrespective of their size. That's not universally true. There are - There are a few of the smaller craters

around which do not have a discernable rim. The ground mass throughout the area is a very fine sand to a silt. I'd say the thing that would be most like it on Earth is powdered graphite. Immersed in this ground mass are a wide variety of rock shapes, sizes, textures, rounded and angular, many with varying consistencies. As I said, I've seen plain - what looked to be plain basalt and vesicular basalt. Others with no crystals, some with small white phenocrysts, maybe one to less than 5 percent. And the boulders - we are in a boulder field where the boulders range generally up to 2 feet with a few larger than that. Now, some of the boulders are lying on top of the surface, some are partially exposed, and some are just barely exposed. And in our traverse around on the surface and particularly working with the scoop, we've run into boulders below the surface - it was probably buried under several inches of the ground mass.

05 03 12 55 CC

Tranquility, Houston. Roger. Very fine description.

05 03 13 05 CDR (TRANQ)

I suspect this boulder field may have some of its origin with this large sharp edged rocky rim crater that we passed over at final descent. Now yesterday I said that was about the size of a football field, and I have to admit it was a little - little hard to measure coming in. But I thought that it might just fit in the Astrodome as we came by it. And the rocks in the vicinity of the - of this rocky rim crater are much larger than these in this area. Some are 10 feet or so and perhaps bigger, and they are very thickly populated out to about one crater diameter beyond the crater rim. Beyond that, there is some diminishing, and even out in this area the blocks seem to run out in rows with irregular patterns, and then there are paths between them where there are considerably less surface evidence of hard rocks. Over.

Tape 79/11 Page 451

05 03 14 16 CC

Tranquility Base, Houston. We copy. Thank you very much.

05 03 14 32 CC

And, Tranquility Base, we're through with the ranging. You can take your S band function switch to OFF RESET.

05 03 14 42 CDR (TRANQ)

Roger.

05 03 14 45 CC

And, Tranquility, I have a LM consumables update for you.

05 03 14 53 CDR (TRANQ)

Roger. Ready to copy.

05 03 14 55 CC

Okay. At 123 plus 00, RCS Alfa 78 - 78 percent PQMD, Bravo is 76 percent PQMD, descent O2 is 62 percent - 62 percent. Descent ampere hours are 590, 590 remaining, ascent ampere hours are 574, 574 remaining. Over.

05 03 15 41 CDR (TRANQ)

Roger. Copy. Sounds very good. Thank you.

05 03 15 44 CC

Roger.

05 03 18 35 CC

Tranquility Base, Houston.

05 03 18 41 CDR (TRANQ)

Go ahead, Houston.

05 03 18 43 CC

Roger. For your P57 ..., we did a little looking around, and it looks like Sirius and Rigel out at detent 6 would be real good on that. The Sun angle on Sirius is about 43 degrees, and on Rigel, it's about 55 degrees. Over.

05 03 19 08 LMP (TRANQ)

Roger, Houston. The only trouble is that the Sun is in number 5, the closed one. And it appears to also be close enough to detent 6 to shine on the far side of the cone. And it completely obscures detent 6. I'm - unable to use that at all.

05 03 19 37 CC

Okay. We understand it now, and thank you.

05 03 20 43 CC

Tranquility, Houston. For your information, the circuitry looks real fine on that ascent engine arm circuit breaker.

Tape 79/12 Page 452

05 03 20 54 LMP (TRANQ)

Roger. I don't think I could get it out now if I wanted to.

05 03 21 00 CC

Roger. We copy.

05 03 21 05 LMP (TRANQ)

And it looks like in detent 6 I can pick up Venus right at the fringe, but I can't get anything else.

05 03 21 15 CC

Roger.

05 03 21 33 CDR (TRANQ)

And by the way, Houston, our EVA antenna did retract.

05 03 21 37 CC

Roger. Mighty fine. Thank you.

05 03 22 45 CC

Tranquility, Houston.

05 03 22 52 LMP (TRANQ)

Roger. Go ahead.

05 03 22 54 CC

Roger. It looks like you're going to have to reposition the radar here. We suggest you may want to start your TIG minus 45 minute - that point in the checklist at about TIG minus 50. Over.

05 03 23 10 LMP (TRANQ)

Roger. Why do you think I need to move the radar?

05 03 23 14 CC

Well, we thought that you probably wouldn't be able to get the star there.

05 03 23 36 LMP (TRANQ)

On the rear detent, the radar can be pointing plus X, and I'm - I'll be using right rear. That's okay.

05 03 23 44 CC

Roger. That's fine then.

05 03 25 43 CC

Tranquility Base, Houston. I have one more late checklist change there on the rendezvous radar position for lift off. Over. From page Surface 57.

05 03 26 00 LMP (TRANQ)

Roger. Go ahead.

05 03 26 01 CC

Okay. On Surface 57 there on your VERB 21 NOUN 73 trunnion, leave it 180; the shaft we'd like 335. Over.

Tape 79/13 Page 453

05 03 26 25 LMP (TRANQ)

Roger. Understand. Shaft 335.

05 03 26 29 CC

Roger. And if the steerable doesn't quite hack it on lift off, looks like the forward OMNI is good for about 30 to 60 seconds after lift off. And then the aft OMNI antenna is good for the rest of the ascent. Over.

05 03 26 52 LMP (TRANQ)

Roger. Copy.

05 03 27 10 LMP (TRANQ)

Houston, we've got two angles here at 3 minutes in ascent. Would you confirm those? Pitch 134 and yaw minus 32. Over.

05 03 27 25 CC

Tranquility Base. Roger. We verify; those are correct.

05 03 30 41 CC

Tranquility Base, Houston.

05 03 30 46 CDR (TRANQ)

Go ahead.

05 03 30 48 CC

Roger. Eagle's looking real fine to us down here. We have a fairly high confidence that we know the position of the LM. However, it is possible that we may have a planes change, but the - In the worst case, it would be up to 30 feet per second. And, of course, we don't expect that at all.

05 03 31 -- BEGIN LUNAR REV 25

05 03 31 15 CDR (TRANQ)

Okay.

05 03 31 24 LMP (TRANQ)

Houston, Tranquility Base. Since we've still got plenty of time I think I'll go ahead and recycle on this 604.

05 03 31 38 CC

Tranquility. Roger. That's okay with us, and we assume that the primary canister is still aboard. Is this correct?

05 03 31 52 LMP (TRANQ)

We have one primary canister on board and one secondary. The other primary is - out in front of the Z - plus - Z pad. Over.

05 03 32 06 CC

Roger. We copy. Thank you.

Tape 79/14 Page 454

05 03 33 41 CDR (TRANQ)

Ready for the blue bag - -

05 03 33 44 LMP (TRANQ)

The PGNS looks consistent today.

05 03 33 47 CC

Hey, that's affirmative, by gosh. Looking great.

END OF TAPE

Tape 80/1 Page 455

05 03 44 15 LMP (TRANQ)

Houston, did you copy NOUN 05, and are you looking at 93? Over.

05 03 44 21 CC

Tranquility Base. It's beautiful.

05 03 44 28 LMP (TRANQ)

Okay. We'll proceed.

05 03 44 31 CC

Roger.

05 03 44 35 LMP (TRANQ)

I know where the star is; I'm not sure the PGNS knows where gravity is.

05 03 44 39 CC

Okay.

05 03 48 04 LMP (TRANQ)

Houston, these are your angles, not ours.

05 03 48 12 CC

Roger, Tranquility.

05 03 48 13 LMP (TRANQ)

Stand by for some change or modification in the angles.

05 03 48 23 CC

Tranquility Base, Houston. Recommend 334, and that should just keep it out of the limit.

05 03 48 32 LMP (TRANQ)

Okay.

05 03 55 19 CMP (COLUMBIA)

Houston, Columbia on 0MNI D Delta. Over.

05 03 55 23 CC

Columbia, Houston. Roger. Loud and clear. And if you would like to take it down, we have the latest position of Tranquility Base. Over.

05 03 55 33 CMP (COLUMBIA)

Go ahead.

05 03 55 36 CC

Roger. It's just west - at west crater, Juliett 0.5, 7.7. Over.

05 03 55 52 CMP (COLUMBIA)

Understand that it is just west of the crater Juliett 0.5 and 7.7. Is that correct?

05 03 56 01 CC

Columbia, Houston. That is correct.

05 03 56 06 CMP (COLUMBIA)

Okay. Thank you, Ron.

Tape 80/2 Page 456

05 03 56 15 CC

Tranquility Base, Houston.

05 03 56 20 LMP (TRANQ)

Go ahead.

05 03 56 21 CC

Roger. Because of the lower load with the rendezvous radar off, we'd like to have battery 5 and 6 on the line now, 1 and 3 off. Over.

05 03 56 53 LMP (TRANQ)

In work.

05 03 56 55 CC

Roger. Thank you.

05 03 57 36 CC

Columbia, Houston. You're still looking mighty fine to us.

05 03 57 43 CMP (COLUMBIA)

...

05 03 58 09 CMP (COLUMBIA)

Columbia is holding inertially at lift off attitude, my DAP is configured as per my procedures at a time of 124 02.

05 03 58 19 CC

Columbia, Houston. Roger. We copy you.

05 03 58 36 CMP (COLUMBIA)

I'm using B and D roll.

05 03 58 41 CC

Tranquility, Houston. Say again.

05 03 58 51 CDR (TRANQ)

Houston, we were not calling.

05 03 58 54 CC

Roger. Columbia, was that Bravo and Delta roll? Over.

05 03 59 00 CMP (COLUMBIA)

Columbia, affirmative.

05 03 59 03 CC

Roger.

05 04 01 27 CC

Columbia and Tranquility, I'll give you a Mark at 20 minutes to go, and that's in about 20 seconds.

05 04 01 56 CC

Stand by.

05 04 01 59 CC

MARK.

05 04 02 00 CC

20 minutes.

Tape 80/3 Page 457

05 04 02 06 CMP (COLUMBIA)
Columbia. Roger.

05 04 03 26 CC
Tranquility Base, Houston.

05 04 03 31 CDR (TRANQ)
Go ahead.

05 04 03 32 CC
Roger. Just a reminder here, we want to make sure you leave the rendezvous radar circuit breakers pulled. However, we want the rendezvous radar mode switch in LGC, Just as it is on Surface 59.

05 04 03 48 CDR (TRANQ)
Okay.

05 04 04 43 CC
Tranquility Base, Houston.

05 04 04 49 CDR (TRANQ)
Roger. Go ahead.

05 04 04 51 CC
Roger. Our guidance recommendation is PGNS, and you're cleared for takeoff.

05 04 05 00 LMP (TRANQ)
Roger. Understand. We're number 1 on the runway.

05 04 05 04 CC
Roger.

05 04 05 47 CDR (TRANQ)
Houston, Tranquility. We're not sure that we got number 2 tank to fire. It's still showing a high pressure.

05 04 06 03 CC
Roger. We confirm that. Try it again.

05 04 06 12 LMP (TRANQ)
Okay. We'll go to number 2 this time.

05 04 06 15 CC
Roger. we concur.

05 04 06 24 LMP (TRANQ)
Roger. No problem.

05 04 08 53 LMP (TRANQ)
Houston, looks like there's very little difference between the two.

05 04 09 00 CC
Roger.

05 04 09 02 LMP (TRANQ)
We've got number 2 reading 3050 and number 1 is reading - 3000 and it drops down to 2990.

Tape 80/4 Page 458

So I'm not sure that it's really indicative that it didn't go. Over.

05 04 09 17 CC

Roger. We copy and we agree.

05 04 09 55 LMP (TRANQ)

Okay. I assume we're - we're GO for lift off, and we'll proceed with the ascent feed.

05 04 10 02 CC

Roger. That's correct, and we'll go ahead and watch tank 2. If it doesn't - tank 2 doesn't decrease, we'll tell you to close the ascent feeds and open the shutoffs. Over.

05 04 10 26 LMP (TRANQ)

Okay. Ascent feeds are open and shutoffs are closed.

05 04 10 31 CC

Roger.

05 04 10 32 LMP (TRANQ)

And I've got the cross feed on.

05 04 12 06 CC

Tranquility Base, little less than 10 minutes here. Everything looks good and we assume the steerable's in track mode AUTO.

05 04 12 20 LMP (TRANQ)

Roger. It is in track mode AUTO.

05 04 12 24 CC

Roger.

05 04 13 10 LMP (TRANQ)

And both ED batteries are GO.

05 04 13 15 CC

Tranquility, Houston. Roger.

05 04 14 44 CMP (COLUMBIA)

Neil, I'm reading you on VHF. You sound good.

05 04 14 50 CDR (TRANQ)

Yes sir. Couldn't be better. It's just purring along.

05 04 17 17 LMP (TRANQ)

Rate scale, 25?

05 04 17 18 CDR (TRANQ)

25.

05 04 17 19 LMP (TRANQ)

ATT translation, four jets. Balance couple ON.

Tape 80/5 Page 459

05 04 17 23 CDR (TRANQ)

Balance couple, ON.

05 04 17 24 LMP (TRANQ)
TTCA jets, PROP PUSHBUTTON RESET, ABORT, ABORT STAGE RESET.

55 04 17 32 CDR (TRANQ)
RESET.

05 04 17 34 LMP (TRANQ)
DEADBAND, MINIMUM. ATT CONTROL to MODE CONTROL; MODE CONTROL, AUTO, both.

05 04 17 42 CDR (TRANQ)
AUTO, AUTO.

05 04 17 49 LMP (TRANQ)
Okay. We're standing by for 2 minutes to - for the guidance steering in the AGS.

05 04 18 23 CC
Eagle, Houston. You're looking good to us.

05 04 18 29 CDR (TRANQ)
Roger.

05 04 19 26 LMP (TRANQ)
...

05 04 19 59 CC
MARK.

05 04 20 00 CC
TIG minus 2.

05 04 20 05 LMP (TRANQ)
Roger. Guidance steering in the AGS.

05 04 20 58 LMP (TRANQ)
Okay. MASTER ARM ON.

05 04 21 33 LMP (TRANQ)
DSKY blanks.

05 04 21 44 CDR (TRANQ)
Got that ascent ... ?

05 04 21 54 LMP (TRANQ)
9, 8, 7, 6, 5, abort stage, engine arm ascent, proceed.

05 04 22 07 LMP (EAGLE)
... Beautiful.

Tape 80/6 Page 460

05 04 22 09 LMP (EAGLE)
26, 36 feet per second up. Be advised of the pitchover. Very smooth. Balance couple, OFF. Very quiet ride. There's that one ... on now.

05 04 22 40 CC
Eagle, Houston. Request manual start override.

05 04 22 47 LMP (EAGLE)
Roger.

05 04 22 52 LMP (EAGLE)

...

05 04 23 04 CC

Eagle, Houston. One minute and you're looking good.

05 04 23 10 LMP (EAGLE)

Roger.

05 04 23 19 LMP (EAGLE)

A very quiet ride, just a little bit of slow wallowing back and forth. Not very much thruster activity.

05 04 23 31 CC

Roger. Mighty fine.

05 04 23 37 LMP (EAGLE)

700, 150 up, beautiful. 9000. PGNS AGS agrees within a foot per second.

05 04 23 59 CC

Eagle, Houston. You're looking good at 2. PGNS, AGS, and MSFN all agree.

05 04 24 06 LMP (EAGLE)

And that's a thousand, 170 up, beautiful. 14 000. And a foot per second again, AGS to PGNS.

05 04 24 32 LMP (EAGLE)

S band looks like it's holding good, Houston.

05 04 24 36 CC

Roger. We concur. It's great.

05 04 24 38 LMP (EAGLE)

1500, 185.

05 04 25 01 CC

Eagle, Houston. You're GO at 3 minutes. Everything's looking good.

05 04 25 07 CDR (EAGLE)

Roger.

05 04 25 17 LMP (EAGLE)

Right on H dot.

Tape 80/7 Page 461

05 04 25 21 CDR (EAGLE)

Coming up to, ... to the right.

05 04 25 22 LMP (EAGLE)

-- this is H dot MAX now.

05 04 25 35 CDR (EAGLE)

We're going right down U.S. 1.

05 04 25 39 CC

Roger.

05 04 26 01 CC

Eagle, Houston. Four minutes; you're going right down the track. Everything's great.

05 04 26 12 LMP (EAGLE)

Now we got - got Sabine off to our right now.

05 04 26 18 CC

Roger.

05 04 26 33 LMP (EAGLE)

240 to go.

05 04 26 56 LMP (EAGLE)

Okay. There's Ritter out there. There it is, right there, there's Schmidt Man, that's impressive looking, isn't it?

05 04 27 10 CC

Eagle, Houston. You're looking good.

05 04 27 13 LMP (EAGLE)

... 55.

05 04 27 17 CDR (EAGLE)

Looking good here. It's a pretty spectacular ride.

05 04 27 40 LMP (EAGLE)

... of to the right.

05 04 28 02 CC

Eagle, Houston. You're still looking mighty fine.

05 04 28 09 LMP (EAGLE)

Roger. Good agreement in DELTA V to go in both AGS and PGNS.

05 04 28 13 CC

Roger.

05 04 28 34 LMP (EAGLE)

Got 800 to go.

05 04 28 41 LMP (EAGLE)

700 to go. Okay, I'm going to open up the main shutoffs.

Tape 80/8 Page 462

05 04 28 56 LMP (EAGLE)

Ascent feed closed; pressure's holding good, cross feed ON, 350 to go.

05 04 29 11 LMP (EAGLE)

Stand by on the engine arm. 90, okay, OFF, 50.

05 04 29 17 LMP (EAGLE)

SHUTDOWN.

05 04 29 23 LMP (EAGLE)

We got 53373, 32.8 feet per second, 60 666.

05 04 29 33 CC

Eagle. Roger. We copy. It's great. Go.

05 04 29 35 LMP (EAGLE)

And we got - got our residuals.

05 04 29 45 LMP (EAGLE)

...

05 04 29 50 CC

Eagle, Houston. Trim residuals.

05 04 29 53 LMP (EAGLE)

...

05 04 30 14 LMP (EAGLE)

We're working on it.

05 04 30 33 CC

Eagle, Houston. Trim looks good.

05 04 30 43 LMP (EAGLE)

That's good.

05 04 30 45 CMP (COLUMBIA)

Eagle, Columbia. ... got a solid lock on in VHF ranging and ... 480 feet per second.

05 04 30 53 CDR (EAGLE)

Okay. That sounds a little - little on the high side.

05 04 30 57 CMP (COLUMBIA)

Yes. I'll update it here shortly.

05 04 30 59 CDR (EAGLE)

Okay.

05 04 31 00 LMP (EAGLE)

Okay, Houston. We show 47.3 by 9.5.

05 04 31 07 CC

Roger. 47.2 by 9.5.

Tape 80/9 Page 463

05 04 31 14 LMP (EAGLE)

AGS has 9.5, 46.6.

05 04 31 23 CC

Eagle, Houston. Copy.

05 04 31 44 CC

Eagle, Houston. Request abort stage, reset, ... PROP reset, and mode control to ATT HOLD when you get a chance to.

05 04 31 52 LMP (EAGLE)

Roger.

05 04 32 44 CC

Eagle, Houston. You can go ahead and proceed with P52 as per nominal.

05 04 32 55 CDR (EAGLE)

Roger, Houston. The Eagle is back in orbit, having left Tranquility Base and leaving behind a - a replica from our Apollo 11 patch and the olive branch.

05 04 33 15 CC

Eagle, Houston. Roger. We copy. The whole world is proud of you.

05 04 33 26 CDR (EAGLE)
We had a lot of help down there.

05 04 33 37 CMP (COLUMBIA)
Eagle, Columbia. I've got 470 now for R dot, and I just broke lock. Could you hold silent for a few seconds here while I reacquire.

05 04 34 09 CMP (COLUMBIA)
Columbia's reacquired you.

05 04 35 23 CC
Columbia, Houston. Request P00 in ACCEPT, and we'll give you a good GO LM vector. Over.

05 04 35 37 CMP (COLUMBIA)
Roger. Houston. Going to ACCEPT.

05 04 37 29 CC
Eagle, Houston. You can go ahead and turn your updata link switch off.

05 04 37 39 CDR (EAGLE)
Roger. It's off.

05 04 37 41 CC
Roger.

05 04 39 06 CC
Columbia, Houston. The computer is yours. Press on.

Tape 80/10 Page 464

05 04 39 12 CMP (COLUMBIA)
Okay.

05 04 39 24 LMP (EAGLE)
Houston, the AGS has a DELTA H of 15.5.

05 04 39 31 CC
Eagle, Houston. Roger. 15.5.

05 04 39 33 LMP (EAGLE)
And a maneuver of - and a maneuver of 51.3.

05 04 39 41 CC
Roger. We copy. And, Eagle, aft OMNI. Over.

05 04 39 55 LMP (EAGLE)
Roger. Aft OMNI.

05 04 40 25 CC
Columbia, Houston.

05 04 41 16 CMP (COLUMBIA)
...

05 04 41 20 LMP (EAGLE)
Roger. It's on.

05 04 41 23 CMP (COLUMBIA)
...

05 04 41 26 LMP (EAGLE)

And I can see it reflecting out my ...

05 04 41 43 CC

Eagle, Houston in the blind. Try low bit rate. Over.

05 04 41 55 LMP (EAGLE)

Roger. Low bit rate. I've got a 3.8 signal strength. Over.

05 04 42 13 CC

Eagle, Houston. Roger. We copy your signal strength 3.8.

05 04 42 51 LMP (EAGLE)

37, I believe.

05 04 48 00 CC

Eagle, Houston.

05 04 48 06 CDR (EAGLE)

Roger. Go ahead.

05 04 48 07 CC

Roger. We saw a very slight jump in cabin and suit pressure there. Could you verify cabin REPRESS valve is closed?

Tape 80/11 Page 465

05 04 48 24 CDR (EAGLE)

Okay. It's closed.

05 04 48 26 CC

Roger. And we've got about 1 minute to before where you ought to be radar tracking, and we've lost data with you.

05 04 48 40 CDR (EAGLE)

Okay. ...

05 04 49 03 LMP (EAGLE)

Okay. Get a pass.

05 04 49 26 LMP (EAGLE)

Got it? ...

05 04 49 42 CMP (COLUMBIA)

Eagle, Columbia. You can turn your ... light off.

05 04 49 46 LMP (EAGLE)

Okay. You got it?

05 04 49 48 CDR (EAGLE)

Yes.

05 04 49 50 LMP (EAGLE)

All ready to mark, X and Y. Okay. Marked X now.

05 04 49 58 CMP (COLUMBIA)

...

05 04 50 02 LMP (EAGLE)

X or Y? Maybe we ought to be satisfied with three of them.

05 04 50 14 CMP (COLUMBIA)

...

05 04 50 21 CC

Columbia, Houston - -

05 04 50 22 LMP (EAGLE)

... is still on.

05 04 50 23 CC

- - Say again.

05 04 50 25 LMP (EAGLE)

X or Y?

05 04 50 29 CMP (COLUMBIA)

Tape 80/12 Page 466

05 04 50 35 LMP (EAGLE)

I can't tell.

05 04 50 54 LMP (EAGLE)

Okay. Mark Y.

05 04 51 06 LMP (EAGLE)

That enough? Beautiful! All zeros. Okay. Let's torque them. I'll write them down. Minus 06, plus 64, plus ... 7. Torque ... Radar circuit breakers in?

05 04 50 58 CMP (COLUMBIA)

05 04 52 06 CDR (EAGLE)

Yes. We're pointed down pretty much. We're going to be up - -

05 04 52 08 LMP (EAGLE)

Okay. ... circuit - -

05 04 52 12 CMP (COLUMBIA)

Roger.

05 04 52 13 LMP (EAGLE)

- - breaker in? Both circuit breakers in?

05 04 52 18 CMP (COLUMBIA)

*** - -

05 04 52 19 MS

...

05 04 52 20 CMP (COLUMBIA)

- - ***

05 04 52 26 LMP (EAGLE)

Okay. AUTO maneuver.

05 04 52 36 CMP (COLUMBIA)

05 04 52 40 CC

Columbia, Houston. Did you call?

05 04 52 51 CMP (COLUMBIA)

That's affirmative. I called you before about the VHF ranging. It's not working. ***

05 04 53 01 LMP (EAGLE)

Houston, Eagle. Did you copy our star angle difference and torquing angles.

*** Three asterisks denote clipping of words and phrases.

Tape 80/13 Page 467

05 04 53 07 CC

Eagle, Houston. We didn't have them on the downlink but we copied them on the VOX.

05 04 53 18 LMP (EAGLE)

Okay. It was zero for star angle difference, minus 06, plus 64, and plus 1.37. Over.

05 04 53 28 CC

Eagle, Houston. Roger. We have that.

05 04 54 02 LMP (EAGLE)

That's it. Got a good lockon, Houston.

05 04 54 26 LMP (EAGLE)

... take that.

05 04 54 59 LMP (EAGLE)

How about that?

05 04 55 28 LMP (EAGLE)

Your really think its apogee is 125 21, huh? 25 ... That circuit breaker is in.

05 04 55 54 LMP (EAGLE)

Engine arm circuit breaker.

05 04 57 03 LMP (EAGLE)

Okay. There's a mark. Buy that?

05 04 57 24 CC

Eagle, Houston. If you have time, pitch 162, yaw minus 16.

05 04 58 32 LMP (EAGLE)

You load the REFSMMAT? Okay.

05 04 58 36 CMP (COLUMBIA)

Eagle, Columbia. Your Y dot is minus 1.0. Over.

05 04 58 44 CDR (EAGLE)

Mike, you're ...

05 04 58 53 CMP (COLUMBIA)

Eagle, do you read Columbia? Over.

05 04 59 04 CMP (COLUMBIA)

Eagle, this is Columbia. Over.

05 04 59 10 CMP (COLUMBIA)

Houston, Columbia. Over.

05 04 59 12 CC

Roger, Columbia. Loud and clear now. This is Houston.

Tape 80/14 Page 468

05 04 59 17 CMP (COLUMBIA)

Roger. Would you tell Eagle his Y dot is minus 1.0. Over.

05 04 59 24 CC

Roger. Eagle, Columbia says your Y dot is minus 1.0. Over.

05 04 59 37 CDR (EAGLE)

Roger, Houston. We got that. Thank you.

05 04 59 39 CC

Roger. And you can go high bit rate now. Eagle can.

05 05 00 29 CMP (COLUMBIA)

Eagle, Columbia. How do you read?

05 05 00 44 LMP (EAGLE)

AGS agrees very closely, and pointing ...

05 05 00 57 CMP (COLUMBIA)

Houston, Columbia is unable to read Eagle on either antenna or on VHF duplex Bravo. You got any suggestions?

05 05 01 07 CC

Roger. Columbia, we understand. You are unable to read Eagle. Stand by.

05 05 01 23 CDR (EAGLE)

Houston, tell Columbia that we read him about strength 2.

05 05 02 00 LMP (EAGLE)

Okay. Wide deadband on.

05 05 02 04 CMP (COLUMBIA)

Houston, Columbia. Also my VHF ranging is not working now, and I'd like to know whether you'd like me to continue making sextant marks or do nothing. I'm supposed to be doing VHF marks only, and it's for the next 6 or 7 minutes.

05 05 02 20 CC

Columbia, Houston. Roger. We copy. And, Eagle, looks like the best antenna would be forward for the LM. And, break. Eagle, we missed your loading of the TPI TIG and P32. Could you confirm you've done that?

05 05 03 00 CC

Columbia, Houston. Recommend you take sextant marks and do not reinitialize. Over.

05 05 03 15 CMP (COLUMBIA)

Roger, Houston. Columbia's got the VHF ranging back now. I'll stick with the nominal. Thank you.

Tape 80/15 Page 469

05 05 03 20 CC

Roger. Mighty fine.

05 05 03 38 CMP (COLUMBIA)

Columbia reading you loud and clear now, Eagle.

05 05 04 54 CC

Columbia, Houston.

05 05 05 00 CMP (COLUMBIA)

Go ahead, Houston.

05 05 05 02 CC

Roger. Mike, you can go ahead and get as many VHF and sextant marks as you can here in this period of time.

05 05 05 12 CMP (COLUMBIA)

Roger. I've just got time for maybe two sextant marks, then get on with the final count.

05 05 05 57 CC

Eagle and Columbia, about 1 minute till LOS there on Columbia. It looks like we have about 51.5 for CSI, and we tend to confirm your Y dot. And, break. For Eagle, verify VHF Bravo transmitter is off.

05 05 06 22 LMP (EAGLE)

Roger. VHF Bravo is off.

05 05 06 35 CC

Eagle, Houston. Recommend aft OMNI and are you GO for CSI, so we can let Columbia know. Over.

05 05 06 47 LMP (EAGLE)

Roger. We're GO for CSI.

05 05 06 52 CC

Columbia, Houston. Did you copy? Eagle is GO for CSI.

05 05 06 58 CMP (COLUMBIA)

No, I did not copy. I'm reading them only intermittently, but thank you.

05 05 07 02 CC

Roger.

05 05 08 09 CC

Eagle, Houston. We'll see you coming around the other side. Your AOS time - is 1 minute ahead of the flight plan.

05 05 08 18 CDR (EAGLE)

Okay. Thank you.

Tape 80/16 Page 470

05 05 30 -- BEGIN LUNAR REV 26

END OF TAPE

Tape 81/1 Page 471

05 05 53 27 CMP (COLUMBIA)

...

05 05 53 51 CC

Columbia, Houston. Heard you talked to Eagle? I assume you have COMM with Eagle now?

05 05 55 12 CMP (COLUMBIA)

Houston, Columbia. Over.

05 05 55 29 CMP (COLUMBIA)

Houston, Columbia in OMNI D Delta. Over.

05 05 56 15 CMP (COLUMBIA)

Houston, Columbia. Over.

05 05 56 17 CC

Columbia, Houston. You're very weak. Say again.

05 05 56 26 CMP (COLUMBIA)

Roger. Houston, Columbia. CSI nominal; no plane change. Everything's going beautifully, and the LM seems to be ...your laser...

05 05 56 47 CC

Columbia, Houston. You're about one by, I could just barely make you out. I can't understand.

05 05 57 06 CMP (COLUMBIA)

Houston, Columbia. How now?

05 05 57 22 CMP (COLUMBIA)

Houston, Columbia. Over.

05 05 57 38 CMP (COLUMBIA)

Houston, Columbia. Over.

05 05 58 12 CMP (COLUMBIA)

Houston, Columbia. Over.

05 05 58 24 LMP (EAGLE)

Houston, this is Eagle. Over.

05 05 58 27 CC

Hey, Eagle. Houston loud and clear. Columbia was very weak. We were unable to read him.

05 05 58 36 LMP (EAGLE)

Roger. We saw you come up over the horizon and it looks like you had a laser operating. Could you confirm that?

05 05 58 46 CC

Eagle, Houston. Stand by. We'll check it. And, Eagle, Houston. Can you give us a burn report?

Tape 81/2 Page 472

05 05 59 01 LMP (EAGLE)

Roger. Stand by.

05 05 59 24 LMP (EAGLE)

Okay. The CSI burn was on scheduled time of 125 19 3470, 51.5 feet per second was our solution. After chasing residuals a little bit, we ended up with a minus 0.2, plus 0.7, and minus 0.1. And in the AGS, at that time, we had plus 0.4, plus 0.9, and plus 0.3.

05 05 59 57 CC

Eagle - Eagle, Houston. We copy. Any plane change? Over.

05 06 00 04 LMP (EAGLE)

No. There was no plane change on CSI, and CSM had a 2.3 foot per second burn. We had a 2.9, and we elected to postpone that. Over.

05 06 00 18 CC

Roger. We copy, Eagle. Thank you.

05 06 00 28 CMP (COLUMBIA)

Houston, how do you read Columbia now?

05 06 00 41 CMP (COLUMBIA)

Eagle, how about asking them for some high gain angles for me, will you, please?

05 06 00 46 LMP (EAGLE)

Roger, Houston, do you have some high gain angles for Columbia? Over.

05 06 00 54 CC

Roger, Eagle. And, Columbia, stand by. We'll have them for you shortly.

05 06 01 15 CC

Eagle, Houston. Could you verify you switched lithium hydroxide canisters? Over.

05 06 01 24 LMP (EAGLE)

That's affirmative. We started getting an erratic indication on primary, so we switched to secondary, and it was again erratic and I thought it might have been a sensor. But it's settled down now, and we're on the secondary. Over.

05 06 01 38 CC

Roger. We copy. Mighty fine.

05 06 01 47 CC

Columbia and Eagle. Request OMNI Delta for Columbia.

05 06 01 57 CMP (COLUMBIA)

Roger, Houston. I've been in Delta the whole time but it doesn't ...

05 06 02 09 CDR (EAGLE)

Houston. Columbia's been on Delta, but he hasn't had much luck with you.

05 06 02 18 CC

Eagle, Houston. Roger. We copy.

Tape 81/3 Page 473

05 06 03 20 CMP (COLUMBIA)

Eagle, are you ready to copy your Y dot?

05 06 03 29 CDR (EAGLE)

Go ahead.

05 06 03 30 CMP (COLUMBIA)

05 06 04 25 CC

Eagle, Houston. At your convenience, we'd like to go ahead and try your lithium hydroxides on the primary and let us take a look at it down here.

05 06 05 04 CC

Columbia, Houston. Over.

05 06 05 09 CMP (COLUMBIA)

Go ahead, Houston. ***

05 06 05 39 CDR (EAGLE)

Houston, Eagle. Columbia's been reading you loud and clear on his OMNI's, but he hasn't had any luck in transmitting to you.

05 06 05 50 CC

Roger, Eagle. Mighty fine. We don't hear Columbia though.

05 06 06 00 CDR (EAGLE)

Okay.

05 06 07 32 LMP (EAGLE)

We're burning ours, Mike. Minus 1.8.

05 06 08 32 CC

Eagle, Houston. ...

05 06 08 40 CC

Columbia, Houston. ...

05 06 09 42 CC

Columbia, Houston. Over.

05 06 09 59 CC

Columbia, Houston. You can go ahead and go to REACQ in the high gain. We should get you then.

05 06 10 16 LMP (EAGLE)

Do you have some angles for him, Houston?

05 06 10 18 CC

Roger. Pitch minus 30, yaw 180, for Columbia.

05 06 10 29 LMP (EAGLE)

Okay. And what was your CSI - CDH solution, Mike?

*** Three asterisks denote clipping of words and phrases.

Tape 81/4 Page 474

05 06 10 43 CMP (COLUMBIA)

05 06 11 18 LMP (EAGLE)

Roger. Copy. Thank you.

05 06 11 31 CDR (EAGLE)

And, Houston, Eagle. Got an ECS light - a CO2 light. Partial pressure's reading about one half millimeter.

05 06 11 42 CC

Eagle and Columbia, Houston. Roger. We copy.

05 06 12 03 CMP (COLUMBIA)

Houston, how do you read Columbia?

05 06 12 08 CC

Columbia, Houston. Go.

05 06 12 22 CC

Eagle, Houston. We're sure that's a sensor problem. You can leave it on PRIMARY.

05 06 12 30 CDR (EAGLE)

Okay.

05 06 12 41 CDR (EAGLE)

Roger. We pulled the circuit breakers.

05 06 12 45 CC

Roger, Eagle.

05 06 13 01 CDR (EAGLE)

And our water separator apparently isn't working too well. We're getting a lot of water through the suit loop, and we've changed water separators, but it doesn't seem to have improved the situation any.

05 06 13 20 CC

Eagle, Houston. Roger. We copy.

05 06 13 47 CMP (COLUMBIA)

Eagle, Columbia. Standing by to back you up on the burn. Just let me know how it's going.

05 06 13 53 CDR (EAGLE)

Okay.

05 06 13 58 LMP (EAGLE)

Okay. You want to know what our NOUN 81 is?

05 06 14 03 CMP (COLUMBIA)

Ready to copy.

05 06 14 05 LMP (EAGLE)

Okay. I think you already got the burn time; minus 8.1, minus 1.8, minus 18.2.

*** Three asterisks denote clipping of words and phrases.

Tape 81/5 Page 475

05 06 14 19 CMP (COLUMBIA)

Okay, that's pretty close agreement. And, for burn time, I still have 126 17 46.

05 06 14 26 LMP (EAGLE)

Roger.

05 06 15 06 CC

Eagle, Houston. For warm feeling, we are agreeing with your CDH.

05 06 15 15 LMP (EAGLE)

Congratulations.

05 06 15 28 LMP (EAGLE)

Unfortunately, the chart doesn't agree with it, because the range rate at 36 minutes was off the chart.

05 06 17 18 CMP (COLUMBIA)

Thirty seconds.

05 06 17 20 CDR (EAGLE)

We're ready to burn.

05 06 17 21 CMP (COLUMBIA)

Okay.

05 06 17 31 CMP (COLUMBIA)

Yes. I'm ready. ...

05 06 18 49 CMP (COLUMBIA)

Burn complete?

05 06 18 51 CDR (EAGLE)

Burn complete.

05 06 18 52 CMP (COLUMBIA)

Thank you.

05 06 19 47 CC

Eagle, Houston. When you get a chance, are your LCG's hooked up? And if so, what does the LCG accumulator show?

05 06 20 37 CMP (COLUMBIA)

Eagle, Columbia. Passing over the Landing Site. It sure is great to look down there and not see you.

05 06 20 46 LMP (EAGLE)

...

05 06 21 04 CC

Eagle, Houston.

05 06 21 08 CDR (EAGLE)

Go ahead.

Tape 81/6 Page 476

05 06 21 09 CC

Roger. Did you copy on the LCG, there, and the reading on the water accumulator?

05 06 21 15 CDR (EAGLE)

Yes. Roger. I did. I'm getting ...

05 06 22 20 LMP (EAGLE)

Houston, the water accumulator is right on the line between the red and the green. Over.

05 06 22 26 CC

Eagle, Houston. Roger. We copy.

05 06 24 13 CC

Eagle, Houston.

05 06 24 19 LMP (EAGLE)

Houston, Eagle.

05 06 24 20 CC

Roger. On the water problem, we can't add anything more to it, except the fact that it looks like the water accumulators are up to speed to us down here.

05 06 24 35 CDR (EAGLE)

Okay. It's not going to be too much trouble.

05 06 24 39 CC

Roger. Fine.

05 06 24 40 LMP (EAGLE)

It's just in one suit, too, for some reason.

05 06 26 29 CC

Columbia, Houston. Our COMM problem was traced to a ground station here.

05 06 26 38 CMP (COLUMBIA)

Okay. Glad to hear it.

05 06 26 39 CC

Roger. You're mighty fine now.

05 06 32 35 LMP (EAGLE)

Range rate at 30.

05 06 32 43 CMP (COLUMBIA)

I have a TPI TIG when you guys want to compare them.

05 06 32 48 LMP (EAGLE)

Stand by.

05 06 33 05 LMP (EAGLE)

... 19.8.

05 06 33 15 LMP (EAGLE)

Go ahead, Mike. What have you got?

Tape 81/7 Page 477

05 06 33 19 CMP (COLUMBIA)

127 02 3450.

05 06 33 25 LMP (EAGLE)

You're about 32 seconds *** than we are.

05 06 33 29 CMP (COLUMBIA)

Okay, fine.

05 06 35 01 LMP (EAGLE)

05 06 39 12 SC

*** and I'll do it.

05 06 39 52 LMP (EAGLE)

*** want to get another *** data update ***

05 06 40 50 CMP (COLUMBIA)

Mark it *** range.

05 06 42 55 LMP (EAGLE)

Mark.

05 06 42 56 LMP (EAGLE)

Range rate at 40.

05 06 44 16 CMP (COLUMBIA)

Buzz, I would like to confirm that your TPI TIG is 127 02 02. Over.

05 06 44 25 LMP (EAGLE)

We haven't settled on a final one yet. The last one was - stand by.

05 06 45 04 CMP (COLUMBIA)

Roger. Understand.

05 06 45 12 CMP (COLUMBIA)

Just as soon as you know what TPI TIG is going to be, I would appreciate a call.

05 06 45 18 LMP (EAGLE)

Okay.

05 06 45 24 CMP (COLUMBIA)

Last I got was 32 seconds earlier than mine which would make it 127 02 02.

05 06 45 40 CMP (COLUMBIA)

Thank you. Are you going to be revising that one?

05 06 45 44 LMP (EAGLE)

I think probably so. How late - How late can you take a revision?

*** Three asterisks denote clipping of words and phrases.

Tape 81/8 Page 478

05 06 45 56 CMP (COLUMBIA)

Well, to stay on my time line, I should have it in the next couple of minutes.

05 06 48 07 LMP (EAGLE)

Okay. Latest estimate, 127 03 39.

05 06 48 14 CMP (COLUMBIA)

Thank you kindly,

05 06 48 41 CC

Eagle, Houston.

05 06 48 45 LMP (EAGLE)

Roger. Go ahead.

05 06 48 47 CC

Roger. In the event of the possibility that we may have had some water channeling in those hydroxide canisters, we recommend you stay in the cabin mode from now on. Over.

05 06 49 03 LMP (EAGLE)

Roger.

05 06 51 25 CC

Eagle, Houston.

05 06 51 30 LMP (EAGLE)

Go ahead.

05 06 51 32 CC

Roger. I'd better clarify that cabin mode a little bit there. What we mean is you go ahead and stay in the cabin mode. Helmets and gloves on are your option. And we really have no concern with the CO2. Over.

05 06 51 52 LMP (EAGLE)

Roger. Understand.

END OF TAPE

Tape 82/1 Page 479

05 06 52 51 LMP (EAGLE)

Mike, you already loaded that time? We've got a final one here.

05 06 52 58 CMP (COLUMBIA)

I've already loaded it. I don't think it'll make much difference.

05 06 53 01 LMP (EAGLE)

Roger. Only 9 seconds difference.

05 06 53 04 CMP (COLUMBIA)

MARKS next.

05 06 54 06 CC

Columbia, Houston.

05 06 54 12 CMP (COLUMBIA)

Columbia. Go ahead.

05 06 54 13 CC

Roger, Mike. You can go ahead and arm your logic anytime you want to, and we'll give you a GO so that you can get your PYRO ARM at your convenience.

05 06 54 23 CMP (COLUMBIA)

That's a good idea, babe. You standing by to watch the logic?

05 06 54 26 CC

Affirmative. Give us a Mark.

05 06 54 30 CMP (COLUMBIA)

MARK LOGIC 1.

05 06 54 32 CMP (COLUMBIA)

MARK LOGIC 2.

05 06 54 59 CC

Columbia, Houston. We need the SEQ ARM circuit breakers closed.

05 06 55 08 CMP (COLUMBIA)

Okay. Going in SEQ ARM BATT A, and BATT B.

05 06 55 27 CC

Columbia, Houston. Logic looks good. You can arm your PYRO's at your convenience.

05 06 55 36 CMP (COLUMBIA)

Thank you.

05 06 55 55 CMP (COLUMBIA)

Eagle, Columbia's starting to maneuver to TPI attitude.

05 06 55 58 CDR (EAGLE)

Okay.

Tape 82/2 Page 480

05 06 57 20 CC

Eagle and Columbia, Houston. All your solutions look good to us. Out.

05 06 58 18 LMP (EAGLE)

And, Mike, if you want our target DELTA V, I'll give it to you.

05 06 58 22 CMP (COLUMBIA)

Ready to copy.

05 06 58 23 LMP (EAGLE)

127 03 3082, plus 22.7, plus 1.7, minus 10.6. Over.

05 06 58 41 CMP (COLUMBIA)

127 03 3082, plus 22.7, plus 1.7, minus 10.6. Thank you.

05 07 00 55 CDR (EAGLE)

I'm showing a good bit of out of plane velocity on my cross pointers, Mike.

05 07 01 03 CMP (COLUMBIA)

Roger. I have no indication of it.

05 07 02 32 CMP (COLUMBIA)

Coming up on 1 minute to TIG, Neil. How's it looking?

05 07 02 38 CDR (EAGLE)

Pretty good.

05 07 02 40 CMP (COLUMBIA)

Good.

05 07 02 43 CDR (EAGLE)

That out of plane was in the AGS, not in the radar.

05 07 02 47 CMP (COLUMBIA)

Roger that.

05 07 03 52 CDR (EAGLE)

We're burning.

05 07 03 54 CMP (COLUMBIA)

That a boy!

05 07 04 36 CMP (COLUMBIA)

Burn complete?

05 07 04 40 CDR (EAGLE)

Read burn complete.

05 07 04 42 CMP (COLUMBIA)

Roger. Thank you.

Tape 82/3 Page 481

05 07 04 43 CC

Eagle, Houston. Aft OMNI, low bit rate, an we'll see you at 127 plus 51.

05 07 27 -- BEGIN LUNAR REV 27

05 07 51 42 CDR (EAGLE)

Okay. You've got me.

05 07 52 00 CC

Eagle and Columbia, Houston. Standing by.

05 07 52 05 CDR (EAGLE)

Roger. We're stationkeeping.

05 07 52 08 CC

Roger.

05 07 54 13 CDR (EAGLE)

Okay, Mike. I'll get - try to get in position here, then you got it.

05 07 54 39 CDR (EAGLE)

How does the roll attitude look?

05 07 54 55 CDR (EAGLE)

I'll stop. Matter of fact, I can stop right here if you like that.

05 07 56 30 CC

Eagle, Houston. Middle gimbal. And you might pass to Columbia, we don't have him yet.

05 07 56 35 CDR (EAGLE)

That's right.

05 07 57 34 CDR (EAGLE)

I'm not going to do a thing, Mike. I'm just letting her hold in ATTITUDE HOLD.

05 07 57 40 CMP (COLUMBIA)

Okay.

05 08 00 50 CDR (EAGLE)

You ...

05 08 00 56 CDR (EAGLE)

Okay.

05 08 03 12 CDR

Okay. We're all yours. Roger.

05 08 03 17 CMP

Okay. Okay, I have thrusters B3 and C4 safetied.

05 08 03 30 LMP

Okay.

05 08 03 43 CMP

I'm pumping up cabin pressure.

Tape 82/4 Page 482

05 08 04 29 CMP

That was a funny one. You know, I didn't feel it shock, and I thought things were pretty steady. I went to RETRACT there, and that's when all hell broke loose. Were you guys - did it appear to you to be - that you were jerking around quite a bit during the retract cycle?

05 08 04 50 CDR

Yes. It seemed to happen at the time I put the plus X thrust to it, and apparently it wasn't centered, because somehow or other I accidentally got off in attitude and then the attitude hold system started firing.

05 08 05 09 CMP

Yes. I was sure busy there for a couple of seconds.

05 08 05 19 CMP

Are you hearing me all right? I got a horrible squeal.

05 08 05 22 CDR

Yes. I agree with that, but we hear you okay. Over.

05 08 05 36 CMP

Houston, Apollo 11. Over.

05 08 05 39 CC

Apollo 11, Houston. Go.

05 08 05 44 CMP

Roger. I'm supposed to adjust the oxygen flow in this thing to six tenths of a pound per hour, but being as how this transducer is not working right, could you give me an updated number?

05 08 05 55 CC

Affirmative. You want to go ahead and adjust your O2 flow until it just goes off the peg, and then crank the direct O2 valve back down about 5 degrees. Over.

05 08 06 14 CMP

Boy, you were really waiting for that one, weren't you? Okay, Ron. Thank you.

05 08 06 59 CMP

Houston, I did that, and I believe we are flowing oxygen, but the gage is just pegged FULL SCALE LOW.

05 08 07 08 CC

Roger. That's fine. That's what we expect.

05 08 07 13 CMP

Okay.

05 08 07 24 CMP

Okay. I'm going to go ahead with the tunnel leak check.

05 08 07 32 CC

Columbia, Houston. I have a new LM weight for you whenever you're ready to copy.

Tape 82/5 Page 483

05 08 07 45 CMP

Not right now, Ron. Remind me of it later, would you please?

05 08 07 50 CC

Roger. We'll stand by.

05 08 08 56 CMP

Houston, Apollo 11. I let P47 run longer than I should. I may have deteriorated our state vector slightly.

05 08 09 06 CC

Roger, Apollo 11. That's okay. We'll see later.

05 08 11 03 CMP

Houston, Apollo 11. Go ahead with your DAP up, please.

05 08 11 07 CC

Roger. Your LM weight, 5785. For an R1 we'd like to have 61102, R2 01111. Use BD roll. Over.

05 08 11 35 CMP

Roger. I'm configured now at ... for BD roll, and I have thrusters C4 and B3 turned off, and I copy register 1 61102 01111 and LM weight 5785. Thank you.

05 08 11 52 CC

Roger, Columbia.

05 08 13 57 CMP

Houston, Columbia has completed the leak check, and proceeding with opening the hatch dump valve.

05 08 14 07 CC

Roger, Columbia. Understand you're doing the leak check. I missed anything after that.

05 08 14 13 CMP

I say the leak check is complete, and I'm proceeding with opening the hatch dump valve.

05 08 14 23 CC

Eagle - Columbia, Roger.

05 08 20 03 CMP

Eagle, Columbia.

05 08 20 07 LMP

Go ahead.

05 08 20 08 CMP

My hatch is removed. You can open yours, and I'll start passing stuff up to you.

05 08 20 12 LMP

Okay.

05 08 20 22 CMP

No. Stand by one, first.

05 08 20 27 LMP

Okay.

END OF TAPE

Tape 83/1 Page 484

05 08 28 30 LMP

Mike, you ...

05 08 28 32 CMP

Yes, everything is going fine. Be with you in just a second.

05 08 30 10 CC

Eagle, Houston. Over.

05 08 30 16 LMP

Go ahead, Houston, Eagle here.

05 08 30 17 CC

Roger. Any time prior to jettison there, we'd like an AGS to PGNS align: 400 plus 30 000. Over.

05 08 30 34 LMP

Okay. Any particular attitude you would like the PGNS in when we do that?

05 08 30 47 LMP

No. We're not getting any. Could you give us some course align gimbal angles to move the PGNS to, and then we will align the AGS to the PGNS. Over.

05 08 30 58 CC

Roger. Eagle. We concur. Stand by on the gimbal angles. And also, Eagle, while we've got the command module direct O2 on there, there's a possibility that your cabin relief might relieve if we get up around cabin pressure of about 5.4 or 5.5.

05 08 31 24 LMP

Roger.

05 08 32 05 CC

Eagle, Houston.

05 08 32 10 LMP

Roger. Go ahead.

05 08 32 11 CC

Roger. All we are trying to do is get PGNS and AGS aligned together. Doesn't make any difference on the gimbal angle.

05 08 32 28 CDR

...

05 08 32 34 LMP

Okay. We are pretty close to 000. Is that all right?

05 08 32 38 CC

Eagle, that's beautiful.

05 08 32 44 LMP

Now, you might want to take into account what will happen when the CSM maneuvers to jettison attitude.

Tape 83/2 Page 485

05 08 32 56 CC

Eagle, Houston. We don't care what - All we are trying to do is get a drift rate and see how long it takes them to drift apart on the thing after you jettison.

05 08 33 08 LMP

Okay. Will we be jettisoning at about this attitude? That's okay. I'll align the AGS with the PGNS. You can tell me a little later if you need some help.

05 08 33 22 CC

Eagle, Houston. That's fine.

05 08 36 31 CMP

Houston, Columbia. You want me to roll over and get high gain or anything like that?

05 08 36 38 CC

Columbia, Houston. I can give you some REACQ angles for the high gain on the LM jettison attitude. Then you can go there whenever you want to. The angles are pitch minus 50, and yaw zero.

05 08 37 02 CMP

Okay.

05 08 38 07 CMP

Houston, Columbia. Say again the jettison roll, pitch, and yaw, please.

05 08 38 22 CC

Columbia, Houston. Roll zero, pitch 025, and yaw zero. Over.

05 08 38 36 CMP

Roger. Understand roll zero, pitch 025, yaw zero.

05 08 38 40 CC

That's affirmative.

05 08 39 13 CMP

... in progress. We've moving. Houston.

05 08 40 09 LMP

Houston, Eagle. Over.

05 08 40 12 CC

Eagle, Houston. Go.

05 08 40 18 LMP

Roger. It doesn't appear as though the red hose is going to be much of a competitor to the leading vacuum cleaner brands. Over.

05 08 40 27 CC

There's a little noise there, Buzz. Say again.

05 08 41 54 CC

Eagle, Houston.

05 08 42 02 LMP

Roger. Go ahead.

05 08 42 05 CC

Roger. Just a reminder to be sure to zero the AGS errors before you enable the AGS attitude hold there after you get in burn attitude.

Tape 83/3 Page 486

05 08 42 26 LMP

Roger. You mean SEP attitude?

05 08 42 47 CMP

Houston, how do you read Columbia on high gain now?

05 08 42 50 CC

Hey, Columbia. Houston. Mighty fine; loud and clear.

05 08 42 56 CMP

Same here, Ron. Thanks.

05 08 43 00 CC

And Eagle, Houston. Your steerable antenna angles for jettison attitude are - Over.

05 08 43 22 CDR

Roger. Go ahead.

05 08 43 23 CC

Roger. Pitch 165, yaw 68. Over.

05 08 43 35 CDR

Roger. Pitch 165, yaw 68.

05 08 43 38 CC

Eagle, Houston. Correct.

05 08 45 07 CC

Columbia, Houston.

05 08 45 13 CMP

Columbia. Go ahead.

05 08 45 15 CC

Roger, Mike. You want to tweak the O2 flow up just a bit there?

05 08 45 22 CMP

Okay. Coming up. Houston, do you have any preferences as to what you want us to do with the probe? Over.

05 08 45 36 CC

Columbia, Houston. Stand by one.

05 08 45 43 CMP

Okay. Eagle says they've got a place for it inside there, so no problem.

05 08 45 48 CC

Roger. That's all we were assuming.

05 08 46 50 CC

Eagle, Houston.

05 08 47 06 CDR

Eagle. Go ahead.

05 08 47 07 CC

Roger. Neil, it looks like your steerable's good. You can put your track mode to slew and high bit rate, please. Over.

05 08 47 19 CDR

Okay. Track mode to slew and high bit rate.

05 08 47 48 CMP

Okay. Stand by just one, please.

Tape 83/4 Page 487

05 08 48 24 CMP

Okay. Shoot them on down.

05 08 49 28 CC

Eagle, Houston.

05 08 49 35 CDR

Go ahead, Houston.

05 08 49 36 CC

Roger. Neil, just a reminder again, the ACA out of detent to zero; the AGS out of there just in case you go to ATTITUDE HOLD shortly.

05 08 49 47 CDR

Okay.

05 08 50 20 CMP

You say you wanted the probe now?

05 08 53 46 CC

Eagle, Houston.

05 08 53 53 CDR

Houston, Eagle. Go ahead.

05 08 53 54 CC

Roger. That ACA out of detent didn't quite do it because the mode control switches were off. Request guidance control to PGNS and then back to AGS, and that will zero the AGS, there. Over.

05 08 54 12 CDR

Say again, please.

05 08 54 14 CC

Roger. Request guidance control switch to PGNS and then back to AGS. Over.

05 08 54 23 CDR

Okay. We still have both mode control switches off. Over.

05 08 54 28 CC

That's okay. That's good.

05 08 54 39 CDR

And I thought I'd just take about 5 seconds here and see if I could get 000 gone, since we're fairly close to gimbal lock right now.

05 08 54 56 CC

Eagle, Houston. That's fine.

05 08 58 03 CC

Columbia and Eagle, Houston. About 5 minutes to LOS. Your LM jet time will be 131 plus 52, and I have the rest of the maneuver PAD if you want it now, or I can give it to you on the next time around.

05 08 58 25 CMP

Stand by one.

05 08 58 43 CMP

Could you read it around the next time around, please?

05 08 58 47 CC

Sure, Mike. That's fine. We'll get it to you then.

Tape 83/5 Page 488

05 09 01 52 CC

Apollo 11, Houston. About a minute and a half to LOS. You're looking great. It's been a mighty fine day.

05 09 02 02 CMP

Boy, you're not kidding.

05 09 26 -- BEGIN LUNAR REV 28

05 09 50 55 CC

Hello, Eagle. Houston. Do you read? Over.

05 09 51 02 CDR

Houston, this is Columbia. Reading you loud and clear. We're all three back inside; the hatch is installed. We're running a pressure check leak check. Everything's going well.

05 09 51 11 CC

Roger, Eagle. Correction - Roger, Columbia. We copy. You guys are speedy; you beat us to the punch. We had a couple of things for you.

05 09 51 25 CDR

What are they?

05 09 51 26 CC

Oh, it was just - We wanted you to close the CO2 sensor breaker and give us an RCS onboard readout out of Eagle, but that's all. Columbia, Houston. We've got a state vector for you if you'll give us P00 in ACCEPT. Over.

05 09 51 54 CDR

Buzz says the CO2 sensor circuit breaker is IN

05 09 51 58 CC

Roger. Thank you very much.

05 09 52 09 CDR

The RCS quantity was approximately 60 at A and 45 percent at B.

05 09 52 14 CC

Roger.

05 09 52 19 CDR

And we're going P00 in ACCEPT.

05 09 52 21 CC

Roger. Thank you.

05 09 54 07 CC

Columbia, Houston. Your friendly White Team's going to be on till we get you on the way home, and we'd like to congratulate everybody on a successful rendezvous and a beautiful EVA. It was a great show for everybody. Over.

05 09 54 25 CMP

Thank you, sir. I'll tell Neil and Buzz.

Tape 83/6 Page 489

05 09 54 39 CDR

Houston, the hatch passes its integrity check. I'm going to go to LM tunnel VENT now, and leave it there.

05 09 54 51 CC

Roger, Colualbia. We copy. That's good, and we'd like a readout on the TEP of about the time you - that Eagle selected the secondary loop. Over.

05 09 55 05 CDR

Stand by.

05 09 55 17 CC

Hello, Columbia. Houston. We got the load in. You can do the VERB 66 and the computer is yours. Over.

05 09 55 24 CDR

Roger.

05 09 56 01 LMP

Houston, Apollo 11. I'd say that the secondary loop was actuated about 15 to 20 minutes ago. Over.

05 09 56 11 CC

Roger. Copy. Columbia. Thank you very much.

END OF TAPE

Tape 84/1 Page 490

05 09 57 20 CC

Columbia, Houston. It looks like you guys are so speedy on us that we're thinking about moving up jettison time to about a GET of 130 plus 30, if that's okay with you all. Over.

05 09 57 41 CMP

That's fine. I've still got to get a P30 PAD from you.

05 09 57 49 CC

Roger. We want to talk to you about that. Mike, we can - for your druthers, we can do it either way. We can either let you do it in the jettison in P30 - correction P47, or we can send you a P30 target load up and then you - let you call P41, whichever you want to do. Over.

05 09 58 13 CMP

Yes, I see. Ron was going to give me a P30 PAD and the flight plan says P47. Out of the two, I prefer to go to P30, P41 route.

05 09 58 20 CC

Roger. Beautiful. We've got the load. If you'll give us P00 and ACCEPT, we'll send you a load up. Stand by.

05 09 58 41 CC

Columbia, Houston. We'd like you to terminate direct O2 flow, and stand by on your P00 and ACCEPT. We'll have to generate a new load due to the moveup on time. Over.

05 09 58 56 CMP

Roger.

05 10 02 13 CC

Columbia, Houston. Over.

05 10 02 19 CMP

Go ahead.

05 10 02 21 CC

Roger, Mike. It looks like if we move up this jettison time and give you a new load, it would require a new attitude, and we can't do that due to the LM already closed out, and it would fight us all the way around and we'd lose COMM with it. We're thinking separating in P47 in about 10 minutes. We're looking at trajectories and we'll be right with you momentarily. Over.

05 10 02 46 CMP

Okay. It's no big thing with me either way.

05 10 02 48 CC

Roger.

05 10 04 34 CC

Hello, Columbia. Houston. We'd like you to start down your jettison checklist. We recommend

Tape 84/2 Page 491

picking up page F11 - 12 and we'd like to jettison at 10 minutes. That'll be 130 14 45. Over.

05 10 04 54 CMP

Right.

05 10 04 57 CC

Columbia, Houston. If that's not satisfactory, let us know. Over.

05 10 05 05 CMP

Right.

05 10 05 36 CDR

Houston, Columbia. How about a GO for logic BUS ARM.

05 10 05 40 CC

Stand by.

05 10 05 48 CC

Columbia, Houston. You've got a GO.

05 10 05 55 CDR

Thank you.

05 10 06 46 CC

Columbia, Houston. You can undock at your convenience, correction, jettison at your convenience. We would like you to jettison Eagle and stationkeep - in P47 and stationkeep, and we'll have another attitude and a maneuver for you so we'll be okay for TEL. Over.

05 10 07 08 CDR

Roger that.

05 10 07 45 CMP

And I'm standing by to go to P47 just as soon as you give me a go for PYRO ARM.

05 10 07 49 CC

Roger. I thought we gave you that. Mike, you're GO for PYRO ARM and you're GO for jettison.

05 10 07 57 CMP

Okay.

05 10 09 13 CMP

Okay. Let her go in 10 seconds.

05 10 09 15 CC

Copy. Out.

05 10 09 40 CMP

NOUN 83 reading minus four balls, minus three balls, 3 or - correction - minus - both register 1 and register 2 are reading minus four balls 3, register 3 is zeros, the EMS remained on 100.0. A fairly loud noise, and it appears to be departing - oh, I would guess several feet per second.

05 10 10 06 CC

Roger, can you kind of stationkeep with it, Mike? Just stand by now.

05 10 10 12 CMP

Will do.

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05 10 10 23 CC

Columbia, Houston. Don't try to chase it, just hold what you've got.

05 10 10 32 LMP

Charlie, did it hold cabin pressure this time?

05 10 10 35 CC

Say again, Buzz. Over.

05 10 10 36 LMP

Okay. I thrust back - I thrust back toward it a little bit, Charlie, and I'm now reading NOUN 83, plus four balls 4, minus four balls 8, and you want me to kill average D. Right?

05 10 10 53 CC

Stand by. That's affirmative. You can exit P47.

05 10 11 05 CDR

There she goes. It was a good one.

05 10 11 08 CC

Roger dodger. We got Eagle looking good. It's holding cabin pressure and it picked up about 2 feet per second from that jettison.

05 10 11 19 LMP

I believe that. I can see some cracks on the outer coating around the tunnel. In the thermal protective covering, I don't think it has anything to do with the structure.

05 10 11 35 CC

Roger.

05 10 12 43 CC

Hello, Columbia, Houston. We'll have an attitude and a little blip burn for you in about 130 30, so we can separate from Eagle. Over.

05 10 12 56 CMP

That's fine.

05 10 16 49 CC

Columbia, Houston. Would you start a maneuver to a pitch of 230 for this little tweak burn? Over.

05 10 17 01 CMP

Roger. Pitch 230.

05 10 17 03 CC

Roger, Mike. And verify track mode in AUTO for the high gain.

05 10 17 15 CMP

We're in REACQ. Is that all right?

05 10 17 17 CC

Say again. We need AUTO.

05 10 17 23 CMP

Say again. We're in REACQ - AUTO REACQ.

05 10 17 26 CC

Roger. We need AUTO, please, sir.

05 10 17 31 CMP

Okay. You got it.

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05 10 17 42 CMP

Roll zero, pitch 320, yaw zero?

05 10 17 47 CC

Right now that's what we're looking at. Stand by. We might have you roll so we can keep the high gain. Stand by.

05 10 17 56 CMP

Roger.

05 10 19 05 CC

Columbia, Houston. Over.

05 10 19 09 CMP

Go ahead.

05 10 19 10 CC

Roger, Mike - -

05 10 19 11 CDR

Apollo 11, these days.

05 10 19 12 CC

Oh, Roger, Apollo 11. We got you going to a posigrade attitude and we want you - this burn will be using minus X thrusters at about 2 or 3 feet per second, and we got a load for you. We'll send it up momentarily. Over.

05 10 19 33 CMP

Okay.

05 10 20 56 CC

Apollo 11, Houston. Would you give us P00 and ACCEPT? We have a load for you. Over.

05 10 21 02 CMP

You got it.

05 10 21 04 CC

Roger, Mike. And our pitch attitude's a little wrong here. If you're ready to copy, I'll give you the SEP PAD. Over.

05 10 21 13 CMP

Go ahead. Ready to copy.

05 10 21 14 CC

Roger. Starting with NOUN 33: 130 30 0000, plus 00020, plus all zeros, plus all zeros. Roll all zeros, pitch 230, yaw zero. NOUN 44 is NA. DELTA-VP 00020, burn time 007, DELTA-VC 00020. We have - The rest of the PAD is NA.

05 10 22 15 CMP

Roger. GET 130 hours 30 minutes, DELTA-VX 2.0, roll zero, pitch 230, yaw zero, DELTA-VC, 2.0.

05 10 22 32 CC

That's affirmative, Apollo 11. And, Mike, it's similar to the SEP burn prior to flight after the undocking here. And the P41 you should see on register 1 - 2, and then you burn minus X until you read 4. Over.

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05 10 24 11 CC

Apollo 11, Houston. Computer's yours. Over.

05 10 24 19 CMP

Roger, Charlie. We switched our OMNI D - Delta, and I lost that last transmission. Would you say again, please? The thing I'm wondering about specifically is that earlier you said it would be minus X thrusters and the PAD indicates plus X. Do you want me to null that to zero or do you want to add 2 and leave it as a 4?

05 10 24 39 CC

Roger, Apollo 11. The way we gave it to you in the attitude we're in, it'll be just like the SEP burn that you had yesterday. You'll see - NOUN 85 will give you a plus 2 and then you just burn minus X until you read 4. Over.

05 10 24 58 CMP

Understand.

05 10 25 50 CC

Apollo 11, Houston. We see you in P41 now. It might take you a couple of minutes to integrate these vectors that we gave you and if you don't make TIG, it's pretty insensitive. You can just let P41 bring you up to TIG, and when you get to zero, you can burn on that. Over.

05 10 26 12 CMP

Okay.

05 10 30 24 CMP

Okay. Burn complete. Residuals: plus three balls 40, plus four balls 7, plus four balls 2, DELTA-V counter 102.1. Over.

05 10 30 38 CC

Copy, Apollo 11. Looks good to us. Over.

05 10 30 43 CMP

Okay.

05 10 33 24 CMP

Houston, Apollo 11. How about coming up with a good communications attitude for us to go to between now and the time we maneuver at TEI attitude.

05 10 33 33 CC

Roger, sir. Stand by.

05 10 34 40 CC

Hello, Apollo 11, Houston. A couple of things for you. Over.

05 10 34 46 CMP

Go ahead.

05 10 34 47 CC

Okay. Mike, you can maneuver to your preliminary TEI attitude as shown on page 398 of the flight plan, and the high gain angles are good as shown in the flight plan, and we'd like you to dump the waste water at 131 05 down to 10 percent. Over.

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05 10 35 13 CMP

Okay. Understand. I'm going to go to roll 1.1, pitch zero - or 52.6, and yaw 13.8, and you want a waste water dump 10 percent starting at 131 05.

05 10 35 28 CC

That's affirmative. Right out the LOS.

05 10 37 10 CMP

Maneuver is in progress, Houston.

05 10 37 14 CC

Copy, 11. Out.

05 10 40 14 CC

Apollo 11, Houston. Over.

05 10 46 46 CMP

Apollo 11 under high gain. How do you read?

05 10 46 50 CC

Five by, 11. How me? Over.

05 10 46 54 CMP

You're loud and clear, Charlie. What - What numbers are you looking at for TEI TIG preliminary; 135 hours 23 minutes, something like that?

05 10 47 05 CC

That's affirmative, Mike. We're looking at about nominal time. We've considered kicking it up a REV, but we don't think this REV track is going to be any good since we had the RCS burn and we need some more tracking to get you a good TEI. Over.

05 10 47 26 CMP

That's what we're looking for.

05 10 47 27 CC

Roger.

05 10 47 39 CC

11, Houston. Looks like it's going to be pretty relaxed time here for the next couple of hours. We'll have you a PAD, of course, the next REV or so, and we'll keep you posted on TEI. Looks like nominal time. Over.

05 10 47 52 CMP

Thank you, Charlie.

05 10 47 57 CC

And your little maneuver back here a moment ago will put you about 20 miles ahead of the LM at TEI.

05 10 48 07 CMP

Okay.

05 10 48 42 CMP

Imagine that place has cleared out a little bit after that rendezvous. You can find a place to sit down almost, huh?

05 10 48 47 CC

Roger. Our MOCR's about empty right now. We're taking it a little easy. How does it feel up there to have some company?

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05 10 48 57 CMP

Damn good, I'll tell you.

05 10 49 00 CC

I'll bet. I bet, you'd almost be talking to yourself up there after 10 REVS or so.

05 10 49 07 CMP

No, no. It's a happy home here. It'd be nice to have company. As a matter of fact, it'd be nice to have a couple of hundred million Americans up here.

05 10 49 18 CC

Roger. Well, they were with you in spirit.

05 10 49 19 CMP

Let them see what they're getting for their money.

05 10 49 22 CC

Roger. Well, they were with you in spirit anyway, at least that many. We heard on the news today, 11, that last night - yesterday after you made your landing, New York Times came out with a - headlines, the largest headlines they've ever used in the history of the newspaper.

05 10 49 48 CMP

Save us a copy.

05 10 49 55 CDR

I'm glad to hear it was fit to print.

05 10 49 59 CC

It was great.

05 10 50 08 CC

That's why we didn't read you up any newscast. There really wasn't anything to talk about.

05 10 50 15 CMP

Hello, there, Boss.

05 10 51 36 CC

Apollo 11, Houston. We've got 10 minutes to LOS; see you over the hill at 131 48. Over.

05 10 51 45 CMP

Okay, Charlie. I'll dump the water as soon as we go around the corner.

05 10 51 48 CC

Roger. Everything's looking real good now.

05 10 51 53 CMP

Yes. Same here.

05 10 57 08 CC

Hello, Apollo 11. Houston. Coming up about 4 30 LOS. You're looking great on all your systems. Eagle is purring right along after an hour 30 without any cooling. The PNGS is still looking good. Over.

05 10 57 24 CMP

Roger.

05 11 00 26 CC

Apollo 11, Houston. Will you verify that your rendezvous radar transponder is off? Over.

Tape 84/8 Page 497

05 11 00 38 CMP

It's not, but I'll get it off.

05 11 00 41 CC

Roger. We were seeing - believe it or not, we were seeing some funnies on the Eagle's rendezvous radar, and that was the only theory that we had. It looked like it was a good one.

05 11 00 55 CMP

Good theory.

END OF TAPE

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05 11 25 -- BEGIN LUNAR REV 29

05 11 49 29 CC

Hello, Apollo 11. Houston. We are standing by. Everything is looking great here. Over.

05 11 49 42 LMP

Apollo 11. Roger.

05 12 16 00 CC

Hello, Apollo 11. Houston. If you guys want it, we've got some news, here, we can read up. Over.

05 12 16 09 CDR

Be pleased to have it.

05 12 16 11 CC

Roger, Neil. Starting off: Congratulatory messages on the Apollo 11 mission have been pouring into the White House from world leaders in a steady stream all day. Among the latest are telegrams from Prime Minister Harold Wilson of Great Britain and the King of Belgium. The world's press has been dominated by news of Apollo 11. Some newsmen estimate that more than 60 percent of the news used in papers across the country today concerned your mission. The New York Times which, as we mentioned before, has had such a demand for its edition of the paper today (even though it ran 950 000 copies) said it will reprint the whole thing on Thursday as a souvenir edition. And Premier Alexei Kosygin has sent congratulations to you and President Nixon through former Vice President Humphrey who is visiting Russia. The cosmonauts have also issued a statement of congratulations. Humphrey quoted Kosygin as saying "I want you to tell the President and the American people that the Soviet Union desires to work with the United States in the cause of peace."

05 12 17 21 CC

And Mrs. Robert Goddard said today that her husband would have been so happy. "He wouldn't have shouted or anything. He would just have glowed." She added, "That was his dream, sending a rocket to the Moon." People around the world had many reasons to be happy about the Apollo 11 mission. The Italian police reported that Sunday night was the most crime free night of the year. And in London, a boy who had the faith to bet \$5 with a bookie that a man would reach the Moon before 1970 collected \$24,000. That's pretty good odds.

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05 12 18 00 CC

You're probably interested in the comments your wives have made. Neil, Jan had said about yesterday's activities, "The evening was unbelievably perfect. It is an honor and a privilege to share with my husband, the crew, the Manned Spacecraft Center, the American public, and all mankind; the magnificent experience of the beginning of lunar exploration." She was then asked if she considered the Moon landing the greatest moment in her life. She said "No, that was the day we were married." And Mike, Pat said simply, "It was fantastically marvelous." Buzz, Joan said - apparently couldn't quite believe the EVA on the Moon. She said, "It was hard to think it was real until the men actually moved. After the Moon touchdown, I wept because I was so happy." But she added, "The best part of the mission will be the splashdown."

05 12 18 52 CC

In other news, and there was a little bit, another explorer: Thor Heyerdahl had to give up his attempt to sail a papyrus boat across the Atlantic. The storm damaged boat was abandoned about 650 miles from Bermuda. The speed of the craft had been reduced to about 25 miles a day, and Heyerdahl said the object of the voyage had not been to provide an endurance test for the crew.

05 12 19 21 CC

Looking at the world of sports, let's see here. While you were busy the other day, Joe Namath and football Commissioner Pete Rozelle made the announcement that "Broadway Joe" had agreed to sell his interest in the Bachelors III restaurant and report to the New York Jets. Joe arrived at the Jets' training camp today and had his first workout. Several other Jet players who had held out along with Joe also reported. And Davy Hill, from Jackson, Michigan, won his third major golf in as many starts in the past week. He won the Philadelphia Classic. Hill has won four tournaments so far this year and is the leading money winner this year with a cool \$129,000. And in baseball, the west division of the National League remains a tight race. LA and San Francisco are

one game behind league leading Atlanta. The Astros have a record of 48 wins and 48 losses, and are now in fifth place, seven games out. A twin bill between the Astros and Cincinnati last night was postponed because of rain. The Chicago Cubs

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are still in first place in the East Division. They lead the New York Mets by four and one half games. And in the American League, Baltimore is breezing toward the Eastern Division title. They lead second place Boston by 11 games. Looking ahead, the All Star baseball game is scheduled for tomorrow. And President Nixon was scheduled to see the game and then leave immediately after the game for the Pacific splashdown area before going on his tour of Europe. And that about covers the news this day. You guys have been making most of it and I'm sure we couldn't fill you in on any of the details that you don't already know. Out.

05 12 21 22 CDR

Thank you much, Charlie.

05 12 21 24 CC

You're welcome.

05 12 21 42 CC

11, Houston. We've got a preliminary TEI 30 PAD, if you're ready to copy.

05 12 22 06 CMP

Ready to copy.

05 12 22 10 CC

Roger. Coming at you. TEI 30, SPS/G&N: 36691; minus 061, plus 067 135 23 4149; NOUN 81, plus 32020, plus 06713, minus 02773 181 054 013; NOUN 44, HA is NA, plus 00230 32833 228, DELTA VC 32625 24 1510 355. Next three lines are NA. NOUN 61 plus 1103, minus - minus 17237 11806 36275 195 04 52. Your set stars are Deneb and Vega, 242 172 012. We like two jet ullage to 16 seconds. The horizon will be on the 11 degree mark at TIG minus 2 minutes. And other comments: your sextant star is visible after GET of 134 50. Ready for your readback. Over.

05 12 24 39 CMP

Roger. We have a TEI 30, SPS/G&N: 36691, minus 061, plus 067 135 23 4149; plus 32020, plus 06713, minus 02773 181 054 013; NA, plus 00230, plus 32833 228 32625, 24 1510 355; NA three times, plus 1103, minus 17237 11806 36275 195 04 52. Deneb and Vega 242 172 012, two jet ullage, 16 seconds; horizon 11 degree line at TIG minus 2 minutes; sextant star visible after 134 50. Over.

05 12 25 58 CC

Roger, Mike. Good readback. Out.

Tape 85/4 Page 501

05 12 53 02 CC

Hello, Apollo 11. Houston. Seven minutes to LOS; next AOS 133 46. You're looking good going over the hill. Out.

END OF TAPE

Tape 86/1 Page 502

05 13 23 -- BEGIN LUNAR REV 30

05 13 49 44 CC

Hello, Apollo 11. Houston. We're standing by.

05 13 49 54 CMP

Roger. Apollo 11.

05 13 49 56 CC

Roger. We'd like you, sometime at your convenience, to stir up the CRYO's on this pass. And we're wondering if you got the fuel cell purge. Over.

05 13 50 08 CMP

Roger. *** fuel cell purge ...

05 13 50 12 CC

Say again. You're breaking up.

05 13 50 18 CMP

Roger. The O2 fuel cell purge is complete.

05 13 50 22 CC

Roger. Copy.

05 13 52 42 CC

Hello, Apollo 11, Houston. We've got a load for you, if you give us P00 and ACCEPT. The load consists of a CSM pre TEI state vector that's going in the CSM slot, and a post-TEI state vector that'll go into the LM slot, if that's okay; and also a TEI target load. Any comments? Over.

05 13 53 07 CMP

Very good. Thank you very much.

05 13 53 08 CC

Yes, sir.

05 13 53 09 CMP

P00 and ACCEPT. You got it.

05 13 53 10 CC

Thank you.

05 13 53 31 CC

And, 11, Houston. A reminder: you can scratch the VERB 66 at 134 30.

05 13 53 41 CMP

Understand.

05 13 54 03 CC

And, 11, Houston. For your information, Eagle, we had an ISS fail light came on at about 3 19 due to a CDU overheating; and at about this time at AOS it looks like we're about to lose the platform.

*** Three asterisks denote clipping of words and phrases.

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05 13 54 25 CMP

...

05 14 00 09 CC

Apollo 11, Houston. We got the load in. You can have the computer - -

05 14 00 12 LMP

11. Are you through with the computer?

05 14 00 14 CC

That's affirmative, Buzz.

05 14 00 20 LMP

All right. That's timing for you.

05 14 00 41 CC

And, Apollo 11, Houston. Your friendly White Team has your coming home information, if you're ready to copy. Over.

05 14 00 56 LMP

Stand by.

05 14 01 14 LMP

Apollo 11. Ready to copy.

05 14 01 16 CC

Roger, 11. Got two PADS for you, TEI 30 and then a TEI 31. TEI 30 SPS/G&N: 36691, minus 061, plus 066 135 23 4156. NOUN 81: 32 - correction, plus 32011, plus 06818, minus 02650 181 054 014. Apogee is NA, perigee plus 00230 3286 - correction, 32836; burn time 2 28 32628 24 1511 357. Next three lines are NA. NOUN 61: plus 1103, minus 17237 11806 36275 195 04 52. Set stars are Deneb and Vega, 242 172 012. We'd like ullage from two jets for 16 seconds, and the horizon is on the 10 degree line at TIG minus 2 minutes; and your sextant star is visible after 134 plus 50. Stand by on your readback. I have a TEI 31 if you're ready to copy. Over.

05 14 04 14 LMP

Roger. TEI 30, SPS/G&N: 36691, minus 061, plus 066 135 23 4156, plus 32011, plus 06 818, minus 02650, 181 054 014; apogee NA, plus 00230 32836 228 32628 42 1511 357, NA three lines, plus 1103, minus 17237 11806 36275 195 04 52, Deneb and Vega, 242 172 012, two jet ullage, 16 seconds, horizon out of the window, 10 degrees, TIG minus 2 minutes, sextant star at 134 10. Over.

05 14 05 43 CC

Roger, Buzz. Good readback. You're very weak. If you're ready to copy, I got a TEI 31 for you. Over.

05 14 06 01 LMP

All right. Go ahead.

05 14 06 09 CC

Apollo 11, Houston. You were cut out. Say again.

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05 14 06 17 LMP

Roger. Stand by one.

05 14 06 18 CC

Roger.

05 14 06 24 LMP

All right. Go ahead. I'm ready to copy.

05 14 06 27 CC

Roger, 11. TEI 31, SPS/G&N: 36691, minus 061, plus 066 137 22 3985, plus 32838, plus 06845, minus 02487, NA, pitch 052. Rest of the PAD is NA. Ready for your readback. Over.

05 14 07 25 LMP

Roger. TEI 31, SPS/G&N: 36691 minus 061, plus 066, 137 22 3985, plus 32838, plus 06845, minus 02487, NA, pitch 052. The rest is NA. Over.

05 14 07 56 CC

Roger. Good readback. And, Buzz, did you say sextant star is visible after 134 50?

05 14 08 11 LMP

No. I wrote down 134 10. I wasn't real sure about that.

05 14 08 18 CC

Roger. It went by me there. RETRO caught it. It's 134 50. Over.

05 14 08 26 LMP

Okay. 134 50. Thank you.

05 14 08 29 CC

Yes, sir.

05 14 16 53 CC

Hello, Apollo 11. Houston. After the burn, we'd like you to trim X and Z. Over.

05 14 17 05 CMP

Okay, Charlie.

05 14 17 07 CC

Roger. And that's to 0.2 foot per second, as shown in the flight plan.

05 14 17 23 CMP

Sounds like there's a story behind that one, too.

05 14 17 28 CC

We'll tell you when you get back.

05 14 20 22 CC

Hello, Apollo 11. Houston. Would you verify that you've stirred up the CRYO's? Over.

05 14 20 31 CMP

Roger. We've stirred them up.

05 14 20 33 CC

Thank you, sir.

END OF TAPE

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05 14 37 53 CC

Apollo 11, Houston. You are GO for TEI. Over.

05 14 37 59 CMP

Apollo 11. Thank you.

05 14 49 25 CC

Hello, Apollo 11. Houston. You've got about 8 minutes till LOS. Your AOS with the burn, 135 34 05, no burn 135 44. Over.

05 14 49 43 CMP

Okay. Thank you.

05 14 49 46 CC

Yes, sir.

05 14 56 35 CC

Apollo 11, Houston. One minute to LOS. Go sic 'em.

05 14 56 41 CMP

Thank you, sir. We'll do it.

05 15 19 -- BEGIN LUNAR REV 31

05 15 35 14 CC

Hello Apollo 11. Houston. How did it go? Over.

05 15 35 22 CMP

Time to open up the LRL doors, Charlie.

05 15 35 25 CC

Roger. We got you coming home. It's well stocked.

05 15 35 33 CDR

Okay, Burn status: DELTA-TIG was zero, burn time was 2 plus 30. PAD angles: DELTA VGX after trim was 0.1, VGY 0.9, VGZ 0.1. DELTA-VC minus 17.9, fuel 10.6, OX 10.4, unbalance minus 50.

05 15 36 01 CC

Roger. Copy, Neil. Sounds good to us.

05 15 36 16 CC

And Apollo 11, Houston. All your systems look real good to us. We'll keep you posted.

05 15 36 27 CDR

Roger.

05 15 36 28 CDR

Hey, Charlie boy, looking good here. That was a beautiful burn. They don't come any finer.

05 15 36 31 CC

Roger.

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05 15 36 48 CC

Apollo 11, Houston. I wondered if you've compared your state vector accuracy with the one in the LM flights? Over.

05 15 36 59 CDR

Yes, sir, and it looked very nice. VERB 83 was plus 00070 and minus 00008.

05 15 37 10 CC

Roger.

05 15 37 38 CC

11, Houston. I was looking at your bank Bravo nitrogen tank. It didn't leak a bit - correction - didn't leak a bit this time. Over.

05 15 37 51 CDR

Roger. Looked good here.

05 15 37 53 CMP

Chamber pressure was hanging in there around 100. The latter part, of the burn it started oscillating a little bit and got down a little bit below 100.

05 15 37 59 CC

Roger.

05 15 38 00 CMP

96 or so.

05 15 38 01 CC

Roger.

05 15 47 24 CC

Apollo 11, Houston. Would you give us P00 in ACCEPT? We've got a REFSMMAT for you. Over.

05 15 47 36 CMP

Okay.

05 15 47 37 CC

Thank you.

05 15 50 07 CC

Hello, Apollo 11. Houston. We've got the load in. You can go back to BLOCK. Over.

05 15 50 16 CMP

We're there.

05 15 50 18 CC

Roger.

05 15 50 38 CMP

Your command module film seems to be working out pretty well, Charlie, the amount we carried. Looks like we carried just about what we needed.

05 15 50 45 CC

Wonderful.

05 15 50 51 CMP

We have one 16 millimeter roll on the ASA 1000 color interior film. We were thinking of shooting that during the entry, out window number 4 on a bracket, and you might get the camera guide sometime in the next couple of days and give us all the good settings for that.

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05 15 51 09 CC

Roger.

05 15 54 46 CC

Hello, Apollo 11. Houston. I wondered if during the TEI burn you utilized the oxidizer flow valve on the PUGS. Over.

05 15 55 06 LMP

Yes, we did. Based on your very excellent briefing I was expecting the thing to continue desiring increase for the whole time, so we started out with it in INCREASE. I saw that we pretty quickly crossed the line and started falling about 6 or 7 percent behind, so I was still expecting it to move up, and then I went down to FULL DECREASE and brought it back down to a difference of 2 percent. Over.

05 15 55 40 CC

Roger. Thank you very much, Buzz.

05 15 55 41 LMP

Two tenths of a percent, I'm sorry.

05 15 55 43 CC

Roger. Thank you.

05 15 59 37 CC

Apollo 11, Houston. You can go to PTC attitude and torque at your - and do the P52 and torque at your convenience. Over.

05 15 59 50 CMP

Hey, we got to take some more pictures, Charlie. Is there any constraint, normally, in staying here for awhile?

05 15 59 55 CC

No, sir.

05 16 00 00 CMP

Thank you.

END OF TAPE

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05 16 20 37 CC

Go ahead, 11. Over.

05 16 20 42 CMP

How does that tracking look, or is it too early to tell?

05 16 20 45 CC

Stand by, Mike.

05 16 21 12 CC

Apollo 11, Houston. FIDO's are looking at the data. It's too early to tell yet exactly. It's looking real good so far. We'll have you some answers shortly on trajectory. Over.

05 16 21 27 CMP

Okay. What FIDO is that?

05 16 21 33 CC

That's Jay Green.

05 16 21 40 CMP

Howdy, Jay.

05 16 21 54 CC

11, Houston. We have a DAP CSM update for you.

05 16 22 03 CMP

Go ahead.

05 16 22 04 CC

Roger. CSM weight, Mike: 26370. Over.

05 16 22 12 CMP

Thank you, sir.

05 16 22 14 CC

Welcome.

05 16 24 11 CC

Apollo 11, Houston. We've taken your onboard vector and propagated it forward, and it's looking real good. We only got about 24 minutes of tracking now. Really too early to tell on the radar. Over.

05 16 24 26 CMP

Roger. Understand.

05 16 28 08 CC

Hello, Apollo 11. Houston. Mike, did you notice any transients at ignition on TEI? Over.

05 16 28 21 CMP

Yes. The transients were more noticeable than on the previous burns, Charlie. I just wrote it off on the fact we had a light command module, but there was considerable roll activity which dampened down after the first 20 seconds, I would guess, of the burn; but then there was also some pitch and yaw activity. I don't believe it was abnormal, and it seemed to be deadbanding ratherly crisply in roll plus or minus about 8 degrees either side of the center line; and after the

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first couple of - oh, after the first 20 seconds or so, the gimbals were quiet, and pitch and yaw were relatively quiet. Before that, there was some oscillation but mostly just in rates. Total attitude hung in there pretty well.

05 16 29 12 CC

Roger. Thank you much. We were looking at the playback, and we saw some things that - right at start up. We'll be back with you later on that.

05 16 29 22 CMP

Okay.

05 16 42 26 CC

Apollo 11, Houston. Have you finished taking pictures? Over.

05 16 42 36 CMP

We're just finishing up, Charlie.

05 16 42 38 CC

Roger.

05 16 42 45 CMP

About to get started on the P52 here pretty soon.

05 16 42 48 CC

Copy.

05 16 42 50 CMP

Another eight or nine of them.

05 16 52 26 CC

Hello, Apollo 11. Houston. You can crank up on the PTC at any time. Over.

05 16 52 33 CMP

All right-o.

05 16 52 45 CC

Apollo 11, Houston.

05 16 52 50 CDR

Go ahead, Houston.

05 16 52 52 CC

Roger, 11. This is the regional CAP COMM. Congratulations on an outstanding job. You guys have really put on a great show up there. I think it's about time you powered down and got a little rest, however. You've had a mighty long day here. Hope you're all going to get a good sleep on the way back. I look forward to seeing you when you get back here. Don't fraternize with any of those bugs in route except for the Hornet.

05 16 53 21 CDR

Okay. Thank you, boss. We'll - We're looking forward to a little rest and a restful trip back. And see you when we get there.

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05 16 53 30 CC

Roger. You've earned it.

05 16 54 13 CC

Hello, Apollo 11. Houston. We'd like you to turn off O2 tank number 1 heaters. Over.

05 16 54 27 CMP

It's off. Thank you.

05 16 54 29 CC

Roger.

05 16 54 57 CC

Hello, Apollo 11. Houston. For your information, the LGC in Eagle just went belly up at 7 hours. Over.

05 16 55 10 CDR

Okay. Very good, ... death of a real winner, there.

05 16 55 26 CMP

Charlie, we're going to rotate about pitch 270 degrees on the way home vice 1 - or 090 on the way out. Right?

05 16 55 34 CC

Right, sir.

05 16 55 39 CMP

Okay. VERB 49 maneuver to that attitude is in progress.

05 16 55 43 CC

Roger.

05 16 56 14 CDR

Houston, crew status report. Radiation: CDR 11017, CMP 10019, LMP 09020. No medication.

05 16 56 29 CC

Say again, please, Neil. We - you were breaking up. We missed that. Over.

05 16 56 37 CDR

Okay. This is crew status report. Radiation: CDR 11017, CMP 10019, LMP 09020. No medication.

05 16 56 56 CC

Roger. Thank you.

05 16 57 00 CC

And we didn't get any crew status report from you this morning. Wondered if you could give us an estimate of sleep last night. Over.

05 16 57 12 CDR

Okay ...

05 16 57 48 CDR

Okay. We'll take a guess, Charlie, and try to give an equivalent amount. Oh, it's CDR 3, and LMP 4.

05 16 58 00 CC

Roger. Thank you very much.

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05 16 58 25 CDR

And, Charlie, you want the fans cycled ... Right?

05 16 58 30 CC

That's affirmative, and we'd like you to disable quads Charlie and Delta. Over.

05 16 58 38 CMP

Okay. Charlie and Delta.

05 16 59 09 CC

Apollo 11, Houston. If it's convenient, we'd like to go through your onboard readout. Over.

05 16 59 21 CMP

Of what?

05 16 59 22 CC

Oh, excuse me. It's on the flight plan, 3102. We'd like BATTS and RCS. Over.

05 16 59 33 CMP

Stand by.

05 17 00 38 CMP

Ready to copy, Houston?

05 17 00 40 CC

Roger. Go ahead.

05 17 00 44 CMP

BATT Charlie 370, PYRO BATT A 370, BATT B 370; RCS, 55, 65, 64, and 62. Over.

05 17 00 59 CC

Roger. We copy all that. Thank you much.

05 17 01 05 CMP

Roger.

05 17 17 01 CC

Apollo 11, Houston. A couple of questions for the Moon walkers, if you got a second. Over.

05 17 17 09 CDR

Go ahead.

05 17 17 11 CC

Roger, Neil. We're seeing some temperature rises on the passive seismic experiment that are a little higher than normal and were wondering if you could verify the deployed position. We understand it's about 40 feet from the LM in the eleven o'clock position. Over.

05 17 17 37 CDR

No. It's about in the nine or nine thirty position, and I'd say it's about 50 or 60 feet.

05 17 17 50 CC

Roger. Copy. Also, did you notice - was there any indication of any dust cloud as you lifted off? Over.

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05 17 18 02 CDR

Not very much. There was quite a bit of Kapton and parts of the LM that went out in all directions, usually for great distances, as far as I can tell. But I don't remember seeing anything of a dust cloud to speak of.

05 17 18 21 CC

Roger. Understand all you could see was parts of the LM going out. What was your - your first - first comment? Over.

05 17 18 35 CDR

I don't remember. Just that the Kapton and other parts on the LM staging scattering all around the area for great distances, but I didn't see much dust.

05 17 18 50 CC

Roger. Thank you very much.

05 17 21 09 CMP

Houston, Apollo 11. Could you keep me honest on the lithium hydroxide changes? When do you have the next one scheduled for?

05 17 21 16 CC

Stand by.

05 17 22 09 CC

Apollo 11, Houston. Mike, on that canister, we had you due to change one at 133 before TEI, and it's on page 399. The next one we got is at 147. Over.

05 17 22 30 CMP

Okay.

05 17 25 31 CC

Hello, Apollo 11, Houston. We'd like to extend our damping period for another 5 minutes; let the rates get way down. Over.

05 17 25 42 CMP

11. Roger.

05 17 30 12 CMP

Houston, Apollo 11.

05 17 30 14 CC

Go ahead, 11. Over.

05 17 30 19 CMP

Roger, Charlie. Like to bring you up to date on our chlorination status. In compartment B4, we have one, two, three, four, five, six, seven - correction, we have eight pockets for chlorine and buffer ampules, of which - Let me correct that. We have seven pockets, of which one is empty and always has been empty, leaving six remaining. On the other side over there in B7, we have another container with seven pockets, so we have a total of seven plus six, and those are filled with six chlorines and seven buffers. Now, I've been using one chlorine and one buffer per day which, at this point in time, prior to

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this chlorination I'm about to do, leaves me one chlorine and two buffers. Seems to me I'm one chlorine short, and that being the case, I'd like to ask your advice on postponing this chlorination using the last container until some later date, like maybe tomorrow. Over.

05 17 31 41 CC

Roger. We copy, Mike. Stand by.

05 17 31 46 CMP

Okay.

05 17 37 21 CC

Hello, Apollo 11. Houston. Check in A1, Mike, and see what you can find in there. Over.

05 17 37 34 CC

We think you might have some more chlorine up in A1. Over.

05 17 38 25 CC

Hello, Apollo 11. Houston.

05 17 38 42 CMP

Houston, Apollo 11.

05 17 38 50 CC

Apollo 11, Houston. Do you read? You're breaking up. Over.

05 17 38 57 CMP

Roger. Read.

05 17 39 02 CC

Roger, 11. You're breaking up. Mike, please look in compartment A1. We think there might be some more chlorine up there. Over.

05 17 39 21 CMP

Eureka!

05 17 39 26 CC

11, Houston. Reading you about one by. Over.

END OF TAPE

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05 17 41 43 CC

11, Houston. We're having a downlink problem. That's the reason we can't read you. We're switching sites. Stand by.

05 17 42 02 CC

Hello, Apollo 11. Houston. How do you read now? Over.

05 17 42 09 CMP

Fine.

05 17 42 10 CC

Roger. You're five by now, too, Mike. Thank you much. Did you copy that about A1 on that chlorine?

05 17 42 20 CMP

Eureka!

05 17 42 21 CC

How about that, sports fans!

05 17 45 26 CC

Apollo 11, Houston. We're having a little trouble getting the yaw rate damped out to the appropriate value. We'd like you all to be quite like mice for a couple of minutes and let's see if that will help it out. Over.

05 17 45 45 CC

11, Houston. You did great work there. We're ready to spin it up. Over.

05 17 46 30 CC

11, Houston. Did you copy? Over.

05 17 46 43 LMP

Yes. We read you, Charlie. Would you stand by a minute?

05 17 46 46 CC

Roger. No hurry.

05 17 47 18 CC

11, Houston. Shift change time, here. White Team bids you good night; we'll see you tomorrow. Over.

05 17 47 27 CDR

Good night, Charlie. Thank you.

05 17 47 30 LMP

Good night, Charlie. Thank you.

05 17 47 33 CMP

Adios.

05 17 47 35 CC

Adios. Thanks again for a great show, you guys.

05 17 47 41 CMP

Thanks for a great job down there.

05 18 01 52 CC

Apollo 11, Houston. Over.

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05 18 01 59 CMP
Good morning, Ron.

05 18 02 01 CC
Howdy there, Mike. We're ready to go ahead and have you switch to your OMNI positions for your sleep period, and we would like the following high gain switch positions: your high gain antenna in MANUAL, beam width WIDE, pitch is minus 50, and yaw is a plus 270. And just follow the flight plan for remaining COMM configuration. Over.

05 18 02 37 CDR
Roger. Out.

05 18 02 48 CMP
You "Purple" people keep funny hours.

05 18 02 52 CC
Your COMM is pretty weak at this point, Mike. Please say again.

05 18 02 59 CMP
Roger. Disregard.

05 18 03 39 CMP
Houston, Apollo 11.

05 18 03 41 CC
Go ahead, 11.

05 18 03 56 CMP
It's on the way now.

05 18 06 20 CC
Apollo 11, Houston. We'd like for you to go ahead and put your S band antenna OMNI to OMNI and OMNI B. Over.

05 18 07 51 CC
Apollo 11, Houston. How do you read me through Honeysuckle now? Over.

05 18 08 02 CMP
You're loud and clear. Over.

05 18 08 03 CC
Very good. Reading you better now. And did you copy we'd appreciate going S band OMNI and OMNI B at this time? Over.

05 18 08 14 CMP
That's the configuration we're in.

05 18 08 17 CC
Okay. Thank you.

05 18 08 24 CMP
I'll say you "Purple" people keep funny hours.

END OF TAPE

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REST PERIOD - NO COMMUNICATIONS

Tape 91/1 Page 517

REST PERIOD - NO COMMUNICATIONS

Tape 92/1 Page 518

REST PERIOD - NO COMMUNICATIONS

Tape 93/1 Page 519

REST PERIOD - NO COMMUNICATIONS

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REST PERIOD - NO COMMUNICATIONS

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06 03 47 11 CMP

Good afternoon, Houston. Apollo 11. Over.

06 03 47 24 CC

Good morning, 11. This is Houston. Over.

06 03 47 31 CMP

Okay. Crew status report: 88 and 8.5.

06 03 47 38 CC

Roger. 88 and 8.5. When you're ready, we've got a small flight plan update for you.

06 03 48 14 LMP

Houston, we're ready to copy.

06 03 48 16 CC

Roger. At about 148 hours, if you've not already done so, a CO2 filter change, and the H2 purge line heater on 20 minutes before the O2 and H2 purge. At 148 hours, we'd like you to initiate a charge on battery Alfa instead of at 151 hours, and leave the

charge on until we notify you further. At 150 hours GET, waste water dump to 10 percent. We do plan to burn midcourse correction 5. It will be an RCS burn about 5 feet per second at about the nominal time in the flight plan. Over.

06 03 49 24 LMP

Roger. Understand. We'll be accomplishing the filter change shortly, the purge line heater is on ***, O2 and H2 purge shortly, and at 148 will initiate a charge on battery A until you notify us further. At 150 hours, waste water dump to 10 percent. And we're looking forward to midcourse correction 5 at about 5 feet per second at the nominal time. Over.

06 03 49 52 CC

Roger. I've got your consumables update, if you're ready to copy.

06 03 50 02 LMP

Copy.

06 03 50 04 CC

Okay. At GET of 147 plus 00, RCS total minus 2.0 percent, which is about minus 14 pounds. Alfa minus 12.0, Bravo plus 10.0, minus 3.0, minus 2.0. Hydrogen total minus 1.5 pounds, O2 total plus 20 pounds. Over.

06 03 50 50 LMP

Roger. I copy, and our onboard readouts: Alfa, *** 2 percent, Bravo 54 percent, Cocoa's 64 percent, Delta 61 percent. Over.

*** Three asterisks denote clipping of words and phrases.

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06 03 51 19 CC

Roger, 11. Would you read that quad Alfa again, please, Buzz. You're cutting out. It may be - are you operating on VOX? Over.

06 03 51 29 LMP

Negative. Alfa is 53 percent. Over.

06 03 51 36 CC

Roger. We copy.

06 03 51 53 CC

11, from down here on telemetry, all your systems look to be in good shape.

06 04 01 51 CC

Apollo 11, this is Houston. Over.

06 04 01 57 CMP

Go ahead.

06 04 01 58 CC

Roger. Would you ask Buzz to check his biomedical TM sensors for a loose or dried out sensor? We're getting an erratic electrocardiogram reading. That would be one of the three sternal leads. Over.

06 04 02 18 CMP

Okay.

06 04 02 45 CMP

...

06 04 03 58 CC

Apollo 11, this is Houston. Say again your last, please.

06 04 04 07 CMP

Disregard.

06 04 04 11 CC

Roger. Out.

06 04 07 14 CC

Apollo 11, this is Houston. Stand by for a Mark leaving the lunar sphere of influence.

06 04 07 22 CC

MARK.

06 04 07 23 CC

You're leaving the lunar sphere of influence. Over.

06 04 07 31 CMP

Roger. Is Bill Shaffer down there?

06 04 07 34 CC

Negative. But we've got a highly qualified team on in his stead.

06 04 07 42 CMP

Roger. I wanted to hear him explain it again to the press conference.

06 04 07 50 CC

Okay.

06 04 07 54 CMP

That's old Apollo 8 junk, but tell him the spacecraft gave a little jump as it went through the ...

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06 04 07 58 CC

Okay. I'll pass it on to him. Thanks a lot, and Dave Reed is sort of burying his head in his arms right now.

06 04 08 10 CMP

Roger. Out.

06 04 08 15 CDR

Those guys down there in the press room did a pretty good job this morning.

06 04 08 20 CC

Yes, they have.

06 04 08 30 CDR

We don't want them to give up yet, though.

06 04 08 34 CC

No. They'll hang in there for about another 47 hours or so.

06 04 08 39 CDR

Okay.

06 04 22 48 CC

Apollo 11, this is Houston. If you're not busy now, I can read you up the morning news.

06 04 23 01 LMP

Okay. We're all listening.

06 04 23 05 CC

Say again, 11?

06 04 23 11 LMP

Roger. We're all listening. Go ahead.

06 04 23 13 CC

Roger. From the hot wires of the Public Affairs Office: Apollo 11 still dominates the news around the world. Only four nations, Communist China, North Korea, North Viet Nam, and Albania, have not yet informed their citizens of your flight and landing on the Moon. One newsman said that he has run out of ways to describe your success. Tonight, President Nixon is scheduled to watch the All Star baseball game in Washington. After the game, he will depart for the Pacific recovery area. Wednesday evening, he will fly from Johnston Island by helicopter to the Navy communications ship Arlington. Then on Thursday morning, he will reboard the helicopter and fly to the Hornet in time to witness your splashdown. Accompanying the President will be Secretary of State William Rogers and Frank Borman. They will watch the splashdown from the bridge of the recovery ship with Admiral John Sidney McCain, Jr., Commander of the Pacific Forces. Following the President's stay aboard the Hornet, he will depart for his tour of Asia and scheduled visit to Romania. Luna 15 is believed to have crashed into the Sea of Crises yesterday after orbiting the Moon 52 times. The Soviet News Agency TASS reported that "scientific

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research in near Moon space was carried out." Sir Bernard Lovell at Jodrell Bank Observatory said that Luna 15 hit the surface of the Moon at a speed of about 300 miles per hour. Things have been relatively quiet recently in Viet Nam. GI's on patrol were observed carrying transistor radios tuned into your flight. The Armed Forces radio and TV network in Viet Nam gave the mission full coverage. Skirmishes still continue between the Egyptians and Israelis along the Suez Canal. U.N. observers there are trying to halt the action. In Washington, the House Ways and Means Committee has voted to reduce the 27.5 percent oil depletion allowance to 20 percent. We've had rain several times here in the Houston area. Today it is cloudy, and more showers are expected. On the sports front, as we mentioned earlier, the All Star game is tonight. There were no games played yesterday. Last night in New York, the Baseball Writers Association of America named Babe Ruth the greatest ball player of all time. Joe DiMaggio was named the greatest living ball player. Frank Borman made the announcements at a dinner honoring the players. Joe Namath put in a full day at the New York Jets' training camp. Five policemen had a hard time restraining about 500 kids who wanted to touch Broadway Joe. He said he feels fine and will play in the All Star game August 1, if Coach Weeb Eubank lets him. The Oilers' camp at Kerrville got wet yesterday, but the workouts continued. There have been some minor injuries, but nothing too serious. Coach Wally Lemm is satisfied so far with the workouts. The Oilers are expecting attendance by over 30,000 for the preseason game with Buffalo. Apparently, Don Meredith's announced retirement isn't expected to dampen enthusiasm, especially around here in Houston. Mario Andretti won the 200 mile Trenton Auto Race Sunday and is now the leading race driver in the U.S. Auto Club's point standings. And that's about the summary of the morning news this afternoon in Houston. Over.

06 04 26 52 LMP

Look up the Dow Jones Industrials for us.

06 04 26 55 CC

Roger. Stand by a minute, please.

06 04 33 45 CC

Apollo 11, this is Houston. We see you in P00. When you can give us ACCEPT, we have a state vector and target load uplink ready for you.

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06 04 34 15 LMP

Roger, Houston. I'm going ahead and start the computer.

06 04 34 18 CC

Roger. Thank you.

END OF TAPE

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06 04 38 41 CC

Apollo 11, we've completed the uplink. The computer's yours.

06 04 38 48 CMP

Thank you.

06 04 43 41 CC

Apollo 11, this is Houston. Over.

06 04 43 47 LMP

Go ahead.

06 04 43 49 CC

Roger. With respect to the Dow Jones industrials, since closing on Tuesday afternoon the 15th up to about 1:05 p.m. Houston time this afternoon, why, the effect has been a net drop; that is, minus 6 points on the industrial average. So far today since opening, the Dow Jones industrial average has gone down by 11.05 after rising 1 1/2 shortly after opening. Today's performance on the utilities is a drop of 1.63, and railroads a drop of 1.58. Over.

06 04 44 36 CMP

Every flight has to have some disadvantages, I guess.

06 04 44 40 CC

Roger. There is some speculation that you all are responsible for that 1 1/2 point rise right after opening.

06 04 44 55 CMP

Well, don't blame the 11 point drop on us, anyway.

06 04 44 59 CC

Roger.

06 04 45 30 CC

Apollo 11, this is Houston. If you have a minute or so free, I wonder if we could get Mike to give us a little bit of clarification on what happened around about the time of docking. We copied him as mentioning that contact was very smooth, almost imperceptible; and we're a little bit inquisitive or curious about his remarks as to what happened after probe retraction. Over.

06 04 46 00 CMP

Roger. I docked in CMC AUTO, and as I said, I wasn't really sure of the moment of contact. I kept cross checking the docking probe indicators. I got two barber poles indicating that the three capture latches - not capture latches, but the three ... latches had made, and we were soft

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docked. And at that time the situation looked very stable. So, I went to CMC FREE, glanced back out the window and it still looked stable; and I fired primary 2 bottle. And at that time, a gyration began between the two vehicles due I'm not sure to what. Perhaps the LM thrusting or perhaps it was building up prior, and I hadn't noticed it. But anyway, during the RETRACT of the probe, there were yaw - my yaw excursions of, I would guess, around 15 degrees, and I had to come back on, take the FREE switch and throw it back to AUTO, and try to damp them out; and I guess Neil was doing the same in the LM. I'll let him tell you about his side of it. And I thought that we were not going to get a successful RETRACT and hard dock. However, in about - oh, I guess 6 or 8 seconds, I did hear - could see the situation damping out, and then we heard the noise indicating the docking latches had fired; and later on when I got into the tunnel, all 12 of them had properly engaged.

06 04 47 44 CC

Roger.

06 04 47 49 CDR

And on the LM side, we were in AGS MIN deadband ATT HOLD; and at contact, I thrust plus X; and shortly after that we

had a sizable attitude oscillation and thruster firing, so we opened up the deadband to MAX and manually flew the vehicle into stable attitude during the retraction. It went to OFF after ...

06 04 48 28 CC

Roger. Thank you very much. Out.

06 04 50 48 CC

Apollo 11, this is Houston. I have your midcourse correction 5 PAD available when you're ready to copy.

06 04 50 56 LMP

Stand by.

06 04 51 56 CMP

Houston, Apollo 11. Ready to copy.

06 04 52 02 CC

11, this is Houston. Midcourse correction number 5, RCS/G&N: 26025, pitch and yaw trim NA, TIG 150 29 5453, minus 00048, plus all balls, plus 00001 075 159 328; HA is NA; HP plus 00230 00048 011 00048; sextant star 03 0908 382. Boresite star block, none available. Latitude plus 1102, minus 17204 11803 36275 195 03 33, GDC align,

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Deneb and Vega, 007 144 068, no ullage, of course, four quad thrusting. Over. Readback.

06 04 53 51 LMP

Roger. Midcourse number 5, RCS/G&N: 26025, pitch and yaw NA, 150 29 5453, minus 00048, plus all zeros, plus 00001 075 159 328, NA, plus 00230 00048 011 00048 03 0908 382, NA three times, plus 1102, minus 17204 11803 36275 195 03 33, Deneb and Vega, 007 144 068, and four quads for the burn. Over.

06 04 55 17 CC

Apollo 11, this is Houston. Readback correct. Out.

06 05 03 11 CC

Apollo 11, this is Houston. Over.

06 05 03 18 CMP

Roger. Go ahead, Houston.

06 05 03 20 CC

Roger. If Neil has a free minute, we've got a question or two regarding the CO2 partial pressure and water in the suit loop discrepancies noted yesterday. Over.

06 05 03 33 CDR

Go ahead.

06 05 03 36 CC

Roger, 11. Was water noted in both suits or only in yours, Neil?

06 05 03 44 CDR

I think only in my suit.

06 05 03 48 CC

Okay. Can you locate that occurrence for us in time when you first noticed water in the suit, either by mission time or relation to any particular event?

06 05 04 17 CDR

I think it was after insertion sometime, Bruce. I don't remember exactly when. I - It was when we were in orbit and had our - after we took our helmets off.

06 05 04 31 CC

Roger. Did you call it to us when you first noticed it, or was it sometime after when you called it?

06 05 04 38 CDR

I'd guess it might have been probably 20 minutes after I noticed it that I mentioned it to you.

06 05 04 44 CC

Roger. Was this noticing the water accompanied by erratic CO2 partial pressure readings, or was that a separate problem? Over.

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06 05 04 57 CDR

Well, the water problem evidenced itself before we noted any erratic motions of the PCO2 gage.

06 05 05 06 CC

Roger. And what was the relative sequence on selecting water separator number 2 and the secondary CO2 canister; that is, did you go to the secondary water separator first and then the secondary CO2? Over.

06 05 05 27 LMP

I believe we went to secondary CO2 first.

06 05 05 33 CDR

Secondary hydroxide - lithium hydroxide.

06 05 05 37 CC

Roger. We copy. And was there any change in your suit loop - -

06 05 05 40 CDR

No.

06 05 05 41 CC

Go ahead.

06 05 05 44 LMP

I should mention, Bruce, that when I went to water secondary - water separator to secondary there, I didn't notice any change. But about after 15 minutes or 20 minutes, the water stopped coming out. So maybe that was just water that was already in the loop that was still blowing out, but the secondary water separator was operating properly.

06 05 06 11 CC

Roger. Did you make any changes in the suit loop configuration after you went from the egress mode to the cabin mode after insertion; that is, in particular, they're interested in knowing if you recall changing the diverter valve position to EGRESS at any time while you were on the secondary canister? Over.

06 05 06 36 CMP

No. I don't believe we did that at all, Bruce.

06 05 06 40 CC

Okay, 11. Thank you. That sums up our questions for now, and we'll crank these back into the engineering pipeline and see what we can come up with.

06 05 06 51 LMP

Okay. Are you satisfied that the CO2 circuit breaker was in on jettison? Over.

06 05 07 00 CC

Say again, please?

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06 05 07 04 LMP

Roger. On LM jettison, are you satisfied that the CO2 circuit breaker was in? Over.

06 05 07 10 CC

Yes. It was in.

06 05 07 17 LMP

Roger. Could you confirm that? I thought there was some question after we got into the command module as to whether that had been left in or not. Over.

06 05 07 34 CC

Roger, 11. It was in and confirmed in, and the readings after jettison stayed about 0.1 to 0.2.

06 05 24 24 CC

Apollo 11, this is Houston. We have not noticed any change in the signal coming through on the LMP's EKG. When he has a little free time, we'd like him to check into it again. Over.

06 05 24 41 LMP

Roger. I looked at all three of the upper chest center ones, and they appear to be fairly tight. I'll push them back in again. Over.

06 05 24 53 CC

Roger. On the TM here, we noticed some fluctuations that may have been attributed to your moving the sensors around or pushing on them, but the erratic problem seems to be persisting.

06 05 44 27 LMP

Houston, Apollo 11. Over.

06 05 44 40 CC

11, this is Houston. Over.

06 05 44 45 LMP

Roger. I wonder if you've noticed any change in the BIOMED returns you're getting. Over.

06 05 44 54 CC

Negative, Buzz. It still looks kind of bad. Apparently, when you move around, it's cutting in and out. Have you checked the little electrical connector where it goes into the signal conditioner? Over.

06 05 45 07 LMP

Yes. They're all about as tight as can be. I tell you what; I'll take them off and put them back on again and see if that makes any difference.

06 05 45 17 CC

Okay. If you would, at your convenience, we'll be watching it down here.

END OF TAPE

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06 06 10 19 CC

Apollo 11, this is Houston. We'd like you to try acquisition on the high gain antenna for us at pitch minus 90, yaw 270. Over.

06 06 10 33 CDR

Roger. That's in work.

06 06 10 37 CC

Roger. Out.

06 06 12 36 CC

11, this is Houston. We're showing about 6.8 percent on waste water on our telemetry now. Over.

06 06 12 48 CMP

Okay. We've got about 9, up here. Over.

06 06 12 51 CC

Roger. Out.

06 06 28 31 CC

11, Houston. We're standing by for your burn. Everything's looking good from down here.

06 06 28 39 LMP

Thank you, Bruce. You've got about a minute and 20 seconds.

06 06 28 42 CC

Roger. We concur.

06 06 31 16 CMP

Houston, do you copy our residuals?

06 06 31 33 CC

Roger. We've got your residual fuel counter reading for us.

06 06 31 43 CMP

DELTA-VC is plus 0.2.

06 06 31 46 CC

Roger. Plus 0.2.

06 06 31 50 CMP

That was actually plus 100.2. Okay?

06 06 31 54 CC

Okay.

06 06 43 34 CMP

Houston, Apollo 11.

06 06 43 38 CC

Go ahead, 11.

06 06 43 43 CMP

Roger. We're in PTC attitude and would you please give us a call when our thruster activity has subsided sufficiently?

06 06 43 52 CC

Roger. Stand by.

06 06 56 41 CC

Apollo 11, this is Houston. We're going to hand over from Madrid to Goldstone at 151 hours even.

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If you should lose lock on the high gain at this time, you may reacquire at pitch minus 45, yaw 270. Break. We're still watching your rates. Over.

06 06 57 05 CDR

Okay. Thank you.

06 07 08 49 CC

Apollo 11, this is Houston. Over.

06 07 08 56 CDR

This is 11, Houston.

06 07 09 07 CC

Apollo 11, this is Houston. Over.

06 07 09 15 CDR

Go ahead, Houston.

06 07 09 17 CC

11, we're still seeing rates on your spacecraft above those we would like for the continuation of the PTC mode which we are still monitoring, and we'll advise you when it has settled down. Over.

06 07 09 34 CDR

Okay.

06 07 21 51 CC

Apollo 11, this is Houston. You are go for the spinup on PTC. Over.

06 07 22 59 CDR

Thank you.

06 07 24 23 CDR

Houston, Apollo 11. Over.

06 07 24 27 CC

Go ahead, 11.

06 07 24 32 CDR

Roger. It didn't like it that time. When I got down to the entry 27303 ENTER, it took off in roll at a high rate in excess of 1 degree per second. Over. I've stopped it now, and we are going to have to go back and do it over again. I'd like to try to find out the reason it did that.

06 07 24 55 CC

Roger. You might as well start setting up for it, and we will be working the problem here.

06 07 25 02 CDR

Okay. Do you have us on high bit rate here now?

06 07 25 07 CC

That's affirmative.

06 07 25 11 CDR

Okay, good. I'll maneuver back to PTC initiation attitude while you guys look at the data and see what you think.

06 07 25 20 CC

Roger.

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06 07 25 50 CDR

Houston, Apollo 11. I think the reason is in having 1620 on the DSKY during the subsequent entries, or at least that's one possibility.

06 07 26 06 CC

Roger. We'll check it out.

06 07 33 33 CC

Apollo 11, this is Houston. While you're waiting for the CSM to settle down and for us to look at the tapes on your latest maneuver, would you feel like answering some more questions with relation to the lunar surface? Over.

06 07 33 52 CDR

Go ahead.

06 07 33 57 CDR

Go ahead, Houston.

06 07 33 59 CC

Roger. For 64 thousand dollars, we're still trying to work out the location of your landing site, Tranquility Base. We think it is located on LAM 2 chart at Juliet 0.5 and 7.8. Do you still have those charts on board? Over.

06 07 34 24 CDR

Yes. Stand by one. They're packed.

06 07 34 31 CC

Roger. You may not have to unpack it. The position which I just gave you is slightly west of West Crater. I guess it's about two tenths of a kilometer west of it, and we were wondering if Neil or Buzz had observed any additional landmarks during descent, lunar stay, or ascent which would confirm or disprove this. One thing that we're wondering about is that if you were at this position, you would have seen the Cat's Paw during ascent just up to the north of your track. Over.

06 07 35 18 CDR

We were looking for the Cat's Paw, too, thinking we were probably downrange, beyond the Big V. But I think that it's likely that that might have been West Crater that we went across in landing, but - Stand by.

06 07 36 22 CDR

We're hoping, Bruce, that our 16 mm film was working at that point in descent, and we'll be able to confirm our touchdown position. We thought that during ascent we might be able to pick up some recognizable objects close to the landing site, and we did see a number of small craters, and crater rows, and things like that, which we may be able to pick out after the fact, but we haven't been able to yet.

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06 07 36 58 CC

Roger. And the next question from our panel is for Buzz. We recall that he reported seeing a laser upon AOS of the Earth the first time after - the first REV after ascent, and we're wondering what color the beam was and if he could determine at the approximate location with respect to the Earth. Over.

06 07 37 25 LMP

It was mostly white, perhaps a tinge of yellowish color to it; and it seemed to be - as I recall it, the terminator of the Earth was toward the horizon and seemed to be about a quarter to a third of the way down from - down towards the terminator of the Earth - from the opposite horizon. That's a third to a quarter Earth radii. Over.

06 07 38 10 CC

Roger. And that puts it in the light side? Over.

06 07 38 18 LMP

Roger. Yes, it was in the light side. The Earth was about - a two thirds lit Earth, with the terminator down toward the horizon. And now coming from the opposite limb of the Earth, the sunlight limb, coming down about one quarter to one third of a radius in from the limb. Generally, pensively located with respect to a line drawn perpendicular to the terminator that goes through the center. Over.

06 07 38 58 CC

Roger, Buzz. We copy.

06 07 39 02 LMP

And I got pictures of that. I'm sure that will show up.

06 07 39 07 CDR

And I saw that, too. It was a very bright spot of light and I confirm Buzz's observation of its position.

06 07 39 15 CC

Okay, 11. Very good. Now, with respect to the documented sample container: on television it appeared to us as though the samples for that container were in fact being given - being selected in accordance with some thought or consideration being given to the rocks themselves. And we were wondering if you could give any further details from memory about any of these samples, and the context of the material or the surface from which they were taken. Over.

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06 07 39 56 CDR

Yes. You remember I initially started on the cut side of the LM that the TV camera was on, and I took a number of samples of rocks on the surface, and several that were just subsurface - about 20 - 15 to 20 feet north of the LM. And then I recalled that that area had been probably swept pretty well by the exhaust of the descent engine, so I crossed over to the southern side of the LM, and took a number of samples from the area around the elongate double crater that we commented on, and several beyond that, and tried to take as many different types - of rock types as I could see by eye - as I could in the short time we had available. There were a number of other samples that I had seen earlier in our stroll around the LM that I had hoped to get back and pick up and put in the documented sample, but I didn't get those, and I'll be able to comment in detail when we get in the debriefing session.

06 07 41 17 CC

Roger. Did you observe any small craters with conspicuously blocky rims? Over.

06 07 41 28 CDR

Well, aside from the one big one that we went over, I guess there were none in our area. I took a stroll back after putting up the EASEP, and while Buzz was starting to unpack the documented samples - took a stroll back to a crater behind us that was maybe 70 or 80 feet in diameter and 15 or 20 feet deep, and took some pictures of it. It had rocks in the bottom of pretty good size, considerably bigger than any that were out on the surface, but there was no - we apparently, at 15 feet or so, had not gotten below the regolith. We were essentially showing no bedrock, at least in the walls of the crater at that depth. Over.

06 07 42 28 CC Roger. We copy,

06 07 42 50 CC

Okay. Thank you, Neil. That about wraps up the questions we have on hand for now.

06 07 43 00 CDR

Okay.

06 07 43 50 CDR

My compliments to the chef. The food is outstanding. This cream of chicken soup I give at least three spoons.

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06 07 43 58 CC

Okay. Cream of chicken, three spoons.

END OF TAPE

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06 07 46 22 CC

Apollo 11, this is Houston. Over.

06 07 46 27 CMP

Go ahead.

06 07 46 29 CC

11, we concur that having VERB 16, NOUN 20 up on the DSKY may well have had some effect on your PTC initiation. It looks like this would give - let the computer work with a knowledge of the actual CDU angles. What we'd like you to do is do a CDU zero which is VERB 40, NOUN 20, ENTER, and then start the PTC procedure again at step 2 with loading VERB 6, NOUN 22, desired attitude in the AUTO maneuver, and all that. Over.

06 07 47 08 CMP

Okay. The only thing I don't understand about that is why it took off at the rate it did. What rate should it have taken off at under that theory?

06 07 47 17 CC

Stand by a minute, Mike.

06 07 52 17 CC

11, CMP, this is Houston. Over.

06 07 52 25 CMP

Go ahead, Houston.

06 07 52 27 CC

Mike, over here on page 9 7 of your checklist where we're setting up PTC, there's been a note penciled in after, "Wait 20 minutes for rate to damp. Do not monitor VERB 16, NOUN 20." It turns out that the significance of that is that, if you are monitoring 16 NOUN 20, then when you get down here in step 7, the second time you do a VERB 24, you've got to reload the NOUN 01 to make it VERB 24, NOUN 01, ENTER, before you load the three registers. Over.

06 07 53 09 CMP

Roger, that. I was just questioning the rate at which the maneuver would begin if that were not done.

06 07 53 17 CC

Roger. We're still working on computing the rate for you.

06 07 53 39 CC

Apollo 11, this is Houston. We'd like you to select REACQ mode on the high gain antenna. Looks like we're about to lose you. Over.

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06 08 17 13 CC

Apollo 11, Apollo 11, this is Houston broadcasting in the blind. If you read us, attempt to acquire on OMNI antennas. Attempt to acquire us on OMNI antennas, if you read. This is Houston. Out.

06 08 18 34 CC

Apollo 11, Apollo 11, this is Houston broadcasting in the blind. If you read, attempt acquisition on an OMNI antenna. Attempt acquisition using an OMNI antenna. Over.

06 08 20 14 CC

Apollo 11, Apollo 11, this is Houston broadcasting in the blind. If you read, attempt contact using OMNI antenna, using an OMNI antenna. This is Houston. Out.

06 08 35 08 CC

Apollo 11, Apollo 11, this is Houston broadcasting in the blind. If you read us, attempt acquisition using an OMNI antenna. Attempt acquisition using an OMNI antenna. This is Houston. Out.

06 08 43 48 CT

... Goldstone.

06 08 43 54 CC

Apollo 11, Apollo 11, this is Houston. Radio check. Over.

06 08 46 15 CT

...

06 08 46 46 CC

Apollo 11, this is Houston. How do you read? Over.

06 08 46 51 CMP

Loud and clear, Bruce. How me?

06 08 46 54 CC

Roger. What antenna are you using?

06 08 47 27 CMP

Houston, Apollo 11 is calling you on the high gain. How do you read? Over.

06 08 47 31 CC

Roger. Loud and clear on the high gain.

06 08 47 48 CMP

So what's new?

06 08 47 51 CC

Oh, we were wondering what was new with you up there.

06 08 47 56 CMP

It's all very quiet. We're just sitting here letting the thruster firing damp down. When they get good enough, let us know, and we'll start this PTC.

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06 08 48 06 CC

Roger.

06 08 48 29 CMP

Nice to sit here and watch the Earth getting larger and larger and the Moon smaller and smaller.

06 08 48 37 CC

Roger. We'll give you a call when your rates have damped down sufficiently, and we're unable at the present time to predict what rate you should have seen at your last attempt to initiate PTC. We saw about 2 1/2 degrees per second. Over.

06 08 48 57 CMP

Yes. I believe that.

06 08 49 21 CMP

Buzz thinks we should have a PTC program built in the computer. He could very well be right.

END OF TAPE

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06 09 19 17 CMP
Houston, Apollo 11.

06 09 19 21 CC
Go ahead, 11.

06 09 19 27 CMP
Roger. I was just checking the radios, and how is the thruster activity coming?

06 09 19 51 CC
11, Houston. The radios are still in good shape, and we are still waiting for your rates to decay. We've got 0.03 degrees per second in pitch now.

06 09 20 05 CMP
Okay. We're - we're in no rush. This is a very pleasant attitude, as a matter of fact. The Sun is down in the LEB, so it's not shining through the windows and heating the place up. We've got the Earth steady out window 1. We have the Moon steadily out window 3 and, of course, we are locked up on the high gain. So as long as the thermal people are happy, we're happy.

06 09 20 29 CC
Roger. We copy.

06 09 33 27 CC
Apollo 11, this is Houston. Over.

06 09 33 33 CMP
Go ahead, Houston.

06 09 33 35 CC
Okay, 11. We are about ready to start PTC. I would like to give you some high gain antenna angles, though. We'd like to operate in the REACQ mode, and do you plan on spinning up in the positive or negative direction? Over.

06 09 33 52 CMP
We can do it either way. I had planned the positive.

06 09 33 53 CC
Okay. For positive, the high gain antenna setting should be pitch plus 30, yaw 270, and in REACQ. Over.

06 09 34 10 CMP
Understand. REACQ, pitch plus 30, yaw 270. Thank you.

06 09 34 14 CC
Roger. And if you would, when you're making your DSKY entries to set up for PTC, go a little slower, and we'll try to follow each entry from down here. Over.

06 09 34 28 CMP
Roger. Out.

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06 09 39 47 CMP
Houston, 11. PTC established.

06 09 39 50 CC
Roger, 11.

06 09 43 05 CC

11, Houston. We observe the PTC to be fairly well established here, and we'll keep you posted on how it's going, and your friendly White Team commentator is taking over now.

06 09 43 23 CMP

Okay. Thanks to all you Black Team.

06 09 43 26 CC

That was the Green Team.

06 09 43 28 CMP

Correction, all you Green Team - correction, Green Team. Excuse me.

06 09 43 31 CC

Roger. Out.

06 09 43 48 CMP

How could I forget. I used to be a "Green" one.

06 09 45 42 CC

Hello, Apollo 11, Houston. Your White Team is now on. We're standing by for an exciting evening of TV and a presleep report. Over.

06 09 53 03

(Unidentifiable Noise)

06 09 53 12 SC

(Laughter)

06 09 53 31 CC

Apollo 11, Houston. You sure you don't have anybody else in there with you?

06 09 53 38 CMP

Houston, Apollo 11. Say again, please.

06 09 53 41 CC

We had some strange noises coming down on the downlink, and it sounded like you had some friends up there.

06 09 53 55 CDR

Where - where do the White Team go during their off hours anyway?

06 09 53 59 CC

Say again.

06 09 56 30

(Unidentifiable Noise)

06 09 58 59

(Unidentifiable Noise)

06 10 40 58 CC

Apollo 11, Houston. Over.

06 10 41 05 LMP

Go ahead, Houston.

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06 10 41 07 CC

Roger. Would you ver - We've lost COMM with you for about the last 10 minutes. Would you verify that the S band track switch is in REACQ? Over.

06 10 41 17 LMP

Negative. It's not. The last time we broke lock, we went to AUTO, and I left it there. Sorry.

06 10 41 22 CC

Roger. We'd like to have you to put it in REACQ, and monitor. In about 2 minutes, we'll be coming up on the high gain. Would you monitor the REACQ? If it doesn't take, acquire manually. Over.

06 10 41 39 LMP

Okay. Say again the angles you'd like.

06 10 41 42 CC

We'll - we'll try to switch it ourselves. Stand by on the angles.

06 10 41 52 CC

Buzz, it's pitch plus 30, yaw 270. Over.

06 10 41 58 LMP

Roger. I've got them.

06 10 42 01 CC

Thank you.

06 10 46 11 CC

Hello, Apollo 11. Houston. Would you please terminate battery charge now? Over.

06 10 46 19 LMP

Roger. Terminating battery charge.

06 10 46 22 CC

Roger.

06 10 50 51 CC

Hello, Apollo 11. Houston. Any special attitude you'd like us to look at for the TV? Over.

06 10 51 09 CMP

I don't guess we have a requirement there, Charlie.

06 10 51 14 CC

Roger. We have an attitude that we can get the Earth out of a window or the Moon. We're trying to look at - find one that we can get both, if that's what you'd like. Over.

END OF TAPE

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06 10 51 33 CMP

A 50 degree roll attitude will probably give us that, Joe.

06 10 51 37 CC

Roger.

06 10 51 49 LMP

That's a good one because it puts the Earth out window 1 and the Moon out window 3 and puts the Sun down in the LEB, so the lighting in here remains relatively constant.

06 10 52 03 CC

Roger. Well, we'll just stop on the 50 roll, then, and we'll give you the word when to do that. Over.

06 10 52 09 CMP

Okay.

06 11 23 08 CC

Apollo 11, Houston. We'll have high gain coverage about 155 30. At that time, you can turn on the TV if you desire, and continue your roll around until you get 50 degrees roll. Over.

06 11 23 26 CDR

Okay.

06 11 28 25 CC

Apollo 11, Houston. We were going to give you the All Star game tonight, but it was rained out. Over.

06 11 28 35 SC

...

06 11 30 05 CC

11, Houston. We're on the high gain. You can warm up the SM now if you like. Over.

06 11 32 45 CC

Apollo 11, Houston. We see you coming up on 50 roll. How does that attitude look? Over.

06 11 34 52 CC

Apollo 11, Houston. We're ready for the TV; we're all configured. At your convenience. Over.

06 11 36 34 CDR

Houston, Apollo 11. Over.

06 11 36 36 CC

Roger. Go ahead, 11. Over.

06 11 36 40 CDR

Are you picking up our TV signals?

06 11 36 42 CC

That's affirmative. We have it up on the Eidephor now. The focus is a little bit out. We see the Earth in the center of the screen.

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Still have a little white dot in the bottom of the camera, apparently. And see some landmasses in the center, at least I guess that's what it is. It's very hazy at this time on our Eidephor. Over.

06 11 37 06 CC

Let me change - -

06 11 37 07 CMP

Believe that's where we just came from.

06 11 37 10 CC

It is, huh? Well, I'm really looking at the bad - at a bad screen here. Stand by one. Hey, you're right.

06 11 37 34 CMP

It's not bad enough not finding the right landing spot - -

06 11 37 35 CC

... screen now.

06 11 37 42 CMP

It's not bad enough not finding the right landing spot when you haven't even got the right planet!

06 11 37 46 CC

I'll never live that one down.

06 11 37 55 CMP

We're making it get smaller and smaller here to make sure that it really is the one we're leaving.

06 11 38 02 CC

All right. That's enough you guys.

06 11 38 14 CC

11, that was a good picture there.

06 11 38 16 CDR

Okay. That's enough of the Moon.

06 11 38 20 CDR

Okay. That's enough of the Moon, Charlie. We're getting set up now for some inside pictures.

06 11 38 22 CC

Roger.

06 11 40 32 CDR

We know there's a lot of scientists from a number of countries standing by to see the lunar samples, and we thought you'd be interested to see them as they really are here. These two boxes are the sample return containers. They - They're vacuum packed containers that were closed in a vacuum on the lunar surface, sealed, and then brought inside the LM and put inside these fiber glass bags, zippered, and resealed around the outside, and placed in these receptacles in the side of the command module. These are the two boxes. And as soon as we get onto the ship,

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I'm sure these boxes will immediately be transferred and delivery started to the Lunar Receiving Laboratory. These boxes include the samples of the various types of rock, the groundmass of the soil, the sand and silt, and the particle collector for the solar wind experiment, and the core tubes that took depth samples of the lunar surface.

06 11 42 07 CC

Roger, Neil. Thank you much for that description. We've got a pretty dark picture down here. Could you check your f stop? We'd like to have it - See if you can open it up a little bit. Over.

06 11 42 20 LMP

Okay. Our monitor showed that to be very bright.

06 11 42 22 CC

Roger.

06 11 42 23 CDR

... We're down around between, well around f:4, which we thought would be plenty light. Well, we'll lighten it up some more.

06 11 42 31 CC

Well, we'd appreciate it. It's pretty dark on all our monitors here.

06 11 42 39 CDR

Okay. Fine.

06 11 42 43 CC

It's looking a lot better now, Neil.

06 11 42 49 CC

There's Buzz.

06 11 43 14 CC

11, Houston. We have an excellent picture now. Over.

06 11 43 19 LMP

Okay. How do you read me, Charlie?

06 11 43 21 CC

Five by now, Buzz. Over.

06 11 43 24 LMP

Okay. The more mundane affairs, now that we've left the Moon, I'd like to trace through them a little bit for you *** developments that have taken place in the food department. I'm sure you've already *** type of a drink container. A little later, Mike will show you how the water gun operates with its new filter to take out the hydrogen. Essentially, this water gun is put in this end and fills up this bag with water, and the drink then dissolves in the water, and this end of the *** outfeeding. Likewise, we have other foods that are more solid nature. You can

*** Three asterisks denote clipping of words and phrases.

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probably see this shrimp cocktail meal. *** this afternoon while the two of us had salmon salad. *** another early development was the use of bite size food ***

06 11 44 37 CC

11, Houston. Buzz, you're breaking up badly. Will you check your VOX? Over.

06 11 44 47 LMP

Roger. How am I coming through now, Charlie?

06 11 44 49 CC

Roger. You're very clear when you come through. It's just that your VOX is not keying at every word. Over.

06 11 44 57 LMP

Okay. These bite sized objects were designed to remove the problem of having so many crumbs floating around in the cabin, so they designed a particular size that would be able to go to the mouth all at once. I think since all of our experience, we've discovered that we could progress a good bit further than that back some of the type meals that we have on Earth. As a matter of fact, on this flight we've carried along pieces of bread, and along with the bread we have a ham spread; and I'll show you, I hope, how easy it is to spread some ham while I'm in zero g.

06 11 46 17 LMP

I think we've discovered that it is quite easy to *** you're all very familiar with.

06 11 46 44 CC

Apollo 11, Houston. We notice your roll rate increasing. Will you please see if you can bring that down to about 04 or we'll be losing high gain shortly. Over.

06 11 47 03 LMP

You can also use zero gravity to demonstrate many things that we've all learned in school. I'd like to demonstrate briefly how easy it is to explain the action of the gyroscope. If I spin this can, we know that according to the equations of motion that we would expect that once this is given a spin, and has a spin axis in this direction, if we give it a particular torque, and I'll do this by pushing my hands against it in this fashion once it's spinning. By the equations we can predict that, as I put this torque on it, it will in fact rotate this direction. Let's see how well this works out.

*** Three asterisks denote clipping of words and phrases.

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06 11 47 53 LMP

See that as I apply the torque this way, it's rotated this way.

06 11 48 12 CMP

Too close, I think.

06 11 48 32 CC

11, Houston. It's a pretty good demonstration.

06 11 48 46 CMP

Houston, this next is a little demonstration for the kids at home, all kids everywhere, for that matter. I was going to show you how you drink water out of a spoon, but I'm afraid I filled the spoon too full and if I'm not careful, I'm going to spill water right over the sides. Can you see the water slopping around on the top of the spoon, kids?

06 11 49 07 CC

That's affirmative, 11.

06 11 49 12 CMP

Okay. Well, as I said, I was going to show you but I'm afraid I filled it too full and it's going to spill over the sides. I'll tell you what. I'll just turn this one over and get rid of the water and start all over again. Okay?

06 11 49 27 CC

Okay.

06 11 49 35 CMP

And you can see, up here we don't know where over is. One up is as good as another. That really is water, though. I'll show you.

06 11 50 04 CMP

That's really not the way we drink. We really have a water gun which I'll show you.

06 11 50 15 CMP

Here's the water gun. This cylindrical thing on the end of it is a filter with several membranes: one allows water to pass, but not any gas; the other allows gas to pass, but not any water. So, by routing the gaseous water which comes from our tank through this filter, we're enabled to drink purified water without the gas in it, filtered water. And, of course, all we do to - to get it started is just pull the trigger.

06 11 50 58 CMP

It's sort of messy. I haven't been at this very long. It's sort of the same system that the Spaniards used to drink out of wineskins at bull fights, only I think this is even more fun. Well, be seeing you, kids.

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06 11 51 14 CC

Thank you from all us kids in the world, here in the MOCR, who can't tell the Earth from the Moon.

06 11 51 23 CMP

Roger. Stand by one, and we'll get you that Earth one.

06 11 51 29 CC

Looks like you need a wine skin up there, Mike.

06 11 51 35 CMP

That'd be nice.

06 11 52 50 CMP

Okay.

06 11 52 54 CC

11, Houston - -

06 11 52 55 CMP

You have a picture now, Houston?

06 11 52 56 CC

That's affirmative. I refuse to bite on this one, though. You tell us.

06 11 53 02 CDR

Okay. This should be getting larger, and if it is, it's the place we're coming home to.

06 11 53 12 CC

Roger.

06 11 53 40 CDR

No matter where you travel, it's always nice to get home.

06 11 53 46 CC

We concur, 11. We'll be happy to have you back.

06 11 53 53 CDR

This is Apollo 11. Signing off.

06 11 53 56 CC

Roger. Thank you very much, 11. That was a good demonstration and a good show. We appreciate it very much.

06 11 57 25 CC

Apollo 11, Houston. We were curious to see if there was any excess moisture up around the tunnel hatch area as we saw on 10. Over.

06 11 57 39 CMP

It just so happens that's what we were talking about now. There is a little bit of dampness around the outside edge of the hatch, but a very, very slight amount. We've got a hose up there that we're hoping will sort of help keep it a little bit dry.

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06 11 57 58 CC

Roger, Mike. Thank you much. Have you seen any more water collecting on the aft bulkhead? Over.

06 11 58 07 CMP

No, we haven't, as a matter of fact. It's been dry in that area since we got rid of that last time.

06 11 58 14 CC

Roger. Thank you.

06 11 58 47 CMP

Apollo 11 is back in PTC attitude. Standing by for thruster quieting.

06 11 58 53 CC

Roger. We see that. Thank you much, Mike.

06 12 07 20 CMP

Houston, Apollo 11. Could you get a little summary of the evening news for us?

06 12 07 26 CC

Yes, sir. We'll have it for you momentarily. Also, a little flight plan update, Mike. If you - On page 3 113, you can delete the O2 fuel cell purge. Over.

06 12 07 38 CMP

Will do.

06 12 07 45 CC

There is a flurry of activity in the PA0 site for the evening news.

06 12 07 52 CMP

Bully.

06 12 08 03 CMP

How's the weather down there? You got any rain?

06 12 08 05 CC

Roger. We've been having a little bit, thunderstorm type, the last couple of days. We had a pretty good rain today, and it's been overcast. A slow storm system's been moving through the area in the last couple of days, and primarily evening and afternoon thundershowers.

06 12 08 26 CMP

Roger. We were watching a few clouds in your area through the monocular along the Texas Gulf Coast this afternoon, and we also noticed there were clouds over Baja California, which is a little bit unusual.

06 12 08 40 CC

Roger. Thank you for the weather report. We can't quite see that far. It seems to have

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cleared up outside now, according to some of the people coming in. This constant overcast in the MOCR here is a little hard to see outside.

06 12 08 58 LMP

Yes. We also noticed it was a little overcast down over - in the Antarctic ice cap, too.

06 12 09 05 CC

Roger. It's apparently raining pretty hard up - -

06 12 09 08 CMP

How's that for one-upsmanship?

06 12 09 10 CC

Yes. (Laughter).

06 12 09 16 CDR

He may know that, but he doesn't even know whether his grass is wet or dry.

06 12 09 25 CC

It's apparently raining fairly hard up in Washington where the All Star game was to be played tonight. They started out, I understand, and then it was rained out and they called it off.

06 12 09 36 CMP

They need a roof on their stadium so they can catch all those flies.

06 12 09 39 CC

Roger.

06 12 09 41 CMP

In the rain.

06 12 09 43 CC

Touché.

06 12 10 01 LMP

Hey, Charlie, what's the preliminary outlook for the weather in our recovery are%?

06 12 10 05 CC

Stand by Buzz. It looks pretty good as far as I could tell. We got the - along the tropical convergence line there, there's a few clouds shown on the weather map I'm looking at here, but nothing of significance. Right now - Stand by. Let's see, right now in the mid - yes, at the MPL - we've got 3000 scattered, visibility 10, waves height 3 feet, is the present weather. I don't think there's anything forecast to be of significance. There are a couple of - FLIGHT just informed me that what I just gave you was the forecast.

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are a couple of tropical storms in the - well, not in the area of landing but in the Pacific. A storm called Claudia which is north - correction - about east of Hawaii. It's going northwest and dissipating. And there's one called Viola, which is out over Guam, and so they aren't any factor at all. It looks like it's going to be real nice for recovery.

06 12 11 35 CC

Navy called up those special calm seas for you guys from up there on the Hudson.

06 12 11 40 LMP

Well, we might need it. We'll get a look at it tomorrow, I guess, though. We'll probably be giving it a pretty close eye.

06 12 11 46 CC

Roger.

06 12 14 03 CC

11, Houston. The RETRO's were wondering if you could fill us in on any non nominal stowage that we have on board. Just location and weight is about all they're interested in. Over.

06 12 14 12 CMP

Roger. We'll do some work on that and let you know, Charlie.

06 12 14 17 CC

Thank you, sir.

06 12 14 44 CC

And, Apollo 11, Houston. Would you please place O2 tank 1 heater to AUTO? Over.

06 12 14 55 CMP

AUTO it is.

06 12 17 02 CDR
Houston, Apollo 11.

06 12 17 04 CC
Go ahead.

06 12 17 10 CDR
What we'll do Charlie, tomorrow, is go through and reconfigure our stowage as closely as possible to nominal. Some things that will not be nominal are as follows: the EVA visors were brought back into the command module, and we have not yet found a home for them. We'll let you know where they go. In addition, there's about 5 pounds of miscellaneous weight from the LM

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in compartment Able 8, and it's taking the place of the LCG's which we moved from A 8 into the suit bag. We got rid of one miscellaneous trash bag, mostly old food wrapping and also old underwear and that helmet protective visor of the CMP's. We left all that with Eagle. And those are about the only off nominals we have.

06 12 18 07 CC
Thank you very much. We appreciate it. Out.

06 12 18 12 CDR
Roger.

06 12 22 12 CC
Apollo 11, Houston. We got the rates looking copacetic. You can go ahead and initiate PTC. Over.

06 12 22 22 CMP
Okay. Thank you.

06 12 22 24 CC
And Buzz, we're still not getting any data from your EKG. It looks like the only way that we're going to be able to get any is if, at your convenience, you would take your - change out your EKG leads, which are the center ones that are connected to the blue pin; and there's a spare one in the medical box. Over.

06 12 22 55 LMP
Roger. How many did you want me to change?

06 12 22 57 CC
Just the center one. I'll get the right nomenclature from the Doc. Stand by. It's called the sternal EKG, which are the three center ones, and it's got - they lead into a - into the blue stringed lead ones. Over.

END OF TAPE

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06 12 23 24 LMP

Okay. There's three of them, is that right?

06 12 23 26 CC

That's affirmative.

06 12 23 30 LMP

And you want me to change all three.

06 12 23 32 CC

That's affirmative and they're all hooked together from the picture I'm looking at, and they go into the center belt, signal conditioner, and it's got the blue strain relief on it.

06 12 23 46 LMP

Yes. I checked the connectors at both ends on that. I don't guess we have a spare signal conditioner or anything like that, do we?

06 12 23 52 CC

No. We do not.

06 12 24 02 LMP

Well, I can show you my heart's still working.

06 12 24 06 CC

We believe it.

06 12 24 23 CDR

Charlie, what we suggest here is, before we start that, turn our two suit powers off and plug his blue lead into my blue signal conditioner and see if we can get his signal through my signal conditioner. Okay?

06 12 24 38 CC

Roger. That's a good suggestion, Neil. We concur. Over.

06 12 26 23 LMP

Okay, Charlie. We're transmitting, and let's see if you get any EKG signal on the CDR at this point.

06 12 26 32 CC

Roger. Stand by.

06 12 26 42 CC

11, Houston. We get some data, but it's got the same problem that we had through Buzz's signal conditioner, so apparently the lead is broken and we'd like you to change it out if you could. Over.

06 12 26 56 LMP

Okay.

06 12 26 58 CC

Thank you.

06 12 38 12 LMP

Houston, Apollo 11.

06 12 38 14 CC

Go ahead, sir.

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06 12 38 17 LMP

Roger. I think the problem was that the center lead had dried out. ... put the new one on, and I'll see how that works. Over.

06 12 38 32 CC

Roger.

06 12 38 36 LMP

I can't tell you how good it feels to get it off.

06 12 38 38 CC

Yes. I can imagine.

06 12 48 41 LMP

Houston, Apollo 11. Houston, Apollo 11.

06 12 48 42 CC

Go ahead, 11. Over.

06 12 48 45 LMP

Roger. How do you read my EKG now?

06 12 48 48 CC

Stand by. We'll let the docs look at it. Buzz, we're on low bit rate. We'll get you on a high gain momentarily, and we'll let you know then. Over.

06 12 49 04 LMP

Okay. I got my high gain antenna coming out.

06 12 49 11 CC

Roger. Just leave on REACQ. We'll get you.

06 12 52 38 CC

Apollo 11, Houston. Buzz, your EKG looks good now. The doc said thanks a lot.

06 12 52 47 LMP

Okay. They're welcome.

06 13 03 55 CC

Apollo 11, Houston. Based on our sighting since the midcourse, we're showing a gamma of minus 6.57. This is preliminary, though, and we think that after some more tracking it should come on in, and we could tweak it right on into the corridor. It's just about in the center of the corridor; everything's looking fine. We'll have you an entry PAD in a couple of hours before you go to sleep. And from our friends in public affairs, a few headlines, other than your flight. You're still dominating the news. However, there are some other things of interest for you. As I mentioned earlier, the All Star game was rained out. It's going to be played tomorrow. However, President Nixon will not be able to see it as he planned. We'll keep you posted on results. And, also, the weathermen are going to be good to you. Our forecast is, looks like it's holding good for the recovery area; it should be real fine out there. President Nixon, as he prepares to fly out to greet

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your return, predicted that within 31 years man will have visited at least one other planet bearing some form of life. "In the year 2000, we, on this Earth, will have visited new worlds where there will be a form of life," he told 2000 foreign exchange students at the White House. Before he left for his week long trip, the President sent Congress his proposal for organizing - reorganizing the Interstate Commerce Commission. He also conferred with chairman Earl Wheeler of the Joint Chiefs of Staff on his return from Viet Nam, and the launch of Intelstat was scrubbed and has been rescheduled for 10 p.m., eastern daylight time on Wednesday. The second stage fuel ground support system showed some contamination.

06 13 05 50 CC

And back in Washington, the House Ways and Means Committee agreed to tax changes affecting oil companies, banks, and utilities that could add nearly 2 billion a year to federal revenue. And, also today, NASA announced it will launch a large orbital workshop in 1972, with a cutdown version of the Saturn V. And, your television pictures attracted a lot of interest. They were shown live throughout just about the whole world, and, we're expecting hundreds of telephone calls from mothers all over the world complaining that their youngsters are trying to drink milk from spoons, thanks to you, Mike.

06 13 06 37 CMP

I take it all back.

06 13 06 40 CC

You need more practice.

06 13 53 37 CC

Hello, Apollo 11. Houston. Buzz, you brought the surgeon right out of his chair. We see you exercising. Over.

06 13 53 49 CDR

Say again.

06 13 53 50 CC

We see you exercising. Is that correct, Buzz?

06 13 53 54 CDR

Yes, that's right. Buzz is.

06 13 53 57 CC

Roger. We've got his heartbeat way up.

06 13 54 03 CDR

Right. He's sort of out of shape.

06 13 54 06 CC

Yes. That's what we thought.

END OF TAPE

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06 13 56 32 CMP

White Team's really got a busy one tonight, huh, Charlie?

06 13 56 36 CC

Say again, Mike. Over.

06 13 56 41 CMP

Say the old White Team's really got a busy one tonight, huh?

06 13 56 43 CC

Oh, boy. We're really booming along here with all this activity. Can barely believe it.

06 13 56 51 CMP

What are you doing? Sitting around with your feet up on the console drinking coffee?

06 13 56 55 CC

(Laughter) You must have your X ray eyes up. You sure can see a long way.

06 13 57 05 CMP

Yes. We're watching you as well, you know.

06 13 57 08 CC

All right.

06 13 57 27 CMP

Two people in the viewing room and that's more than is in the trench.

06 13 57 43 CC

We've got eight in the viewing room, and let's see, about six in the trench right now. And this is the highlight of the day; Buzz's exercise for the surgeon.

06 13 58 10 CC

11, you copy? Over.

06 13 58 15 CDR

Roger. 11.

06 13 58 17 CC

Roger. Neil has the highest heartbeat ever seen on a manned space flight, and we just went low bit rate. The surgeon is about to die. (Laughter)

06 13 58 35 CDR

I measured it up here. It came out to be 247.

06 13 58 45 CC

Boy, that's super.

06 13 59 01 CMP

The unit's on that furlong per fortnight.

06 13 59 04 CC

Roger. We copy that. EECOMM says if you keep that up, you're going to have to change your CO2 canister.

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06 13 59 15 CMP

You were going to make me do that in another 45 minutes anyway.

06 13 59 19 CC

That's true.

06 13 59 26 CMP

That's the highlight of my day. I'm really looking forward to that.

06 14 01 00

(Music: "Music Out of the Moon")

06 14 01 03 CC

Thank you, 11. We appreciate you turning that off. (Laughter)

06 14 03 24 CDR

Charlie, could you copy our music down there?

06 14 03 28 CC

Did we copy what, Neil?

06 14 03 32 CDR

Did you copy our music down there?

06 14 03 34 CC

Roger. We sure did. We're wondering who selected - made your selections?

06 14 03 41 CDR

That's an old favorite of mine, about - It's an album made about 20 years ago, called "Music Out of the Moon."

06 14 03 49 CC

Roger. It sounded a little scratchy to us, Neil. Either that or your tape was a little slow.

06 14 04 01 CDR

It's supposed to sound that way.

06 14 04 03 CC

That's one of those - -

06 14 04 04 CMP

- - it sounds a little scratchy to us too, but the czar likes it.

06 14 04 09 CC

That's what we figured. He and his 40,000 votes.

06 14 04 24 CC

For your info, we got you - It looks like about 150,000 out now.

06 14 04 31 MS

...

06 14 04 33 CMP

It's getting appreciably larger now. It's looking more like the world.

06 14 04 38 CC

Roger. I'm looking at the right side of the screen this time.

06 14 04 42 CMP

How's everything going on the - Say again, Charlie?

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06 14 04 46 CC

Oh, just - I -I'll never hear the last of that one about that Earth/Moon business during the TV there, and I was just saying that I was looking at the right side of the board here, so you are going towards the Earth. What are - What were you going to say, Mike?

06 14 05 01 CMP

You'll have - You'll have fun at the press conference after this shift then, won't you?

06 14 05 06 CC

It's 2:30. Everybody will be asleep. I going to sneak off through the back way.

06 14 05 13 CMP

Okay. I was just wondering how everything is going at the home front. All the wives and kids in one piece?

06 14 05 19 CC

Roger. Sure are. Everything's doing fine. All the gals are having a little party tonight, as far as I know.

06 14 05 27 CMP

Oh, good. Glad to hear it.

06 14 20 40 CC

Apollo 11, Houston. I was just reading some of the transcripts of earlier today about this earlier PTC that we attempted, and when you keyed into VERB 24 and did the two ENTER's, it took off on you. I think we got a story on that, if you'd like to listen to why it had such a high rate, Mike. Over.

06 14 21 06 CMP

Yes. I'm all ears.

06 14 21 08 CC

Okay. I think it would be better if you got your checklist out on 97, and we could walk you through it, and that way I could probably get the story straight. Over.

06 14 21 21 CMP

Okay. I got it.

06 14 21 22 CC

Okay. Mike, what happened is - you know, you were sitting there monitoring VERB 16, NOUN 20, and at step 7 you went into VERB 24, NOUN 01, and keyed in the address and then INFORMATION INFORMATION; and on the final ENTER of that 35400 ENTER, right after that, it - that then put you back into the 16, NOUN 20. Then when you did the VERB 24, ENTER, you were really entering the information in the actual CDU; and when you got the two entries in, in register 1 and 2, it was an - it was an instantaneous change in the actual CDU, and the CM DAP looked at that and saw - saw what it thought it

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had. My - my gosh, I got a 600 degree per second rate. And it turns on the jets to try to take that rate out. And the rate filters that it's looking at - it - well, the rate it's looking at is filtered, so it doesn't really sense the actual rate until the thing is already built up, and then it starts reading the rate filters, and it says, "Well, I really didn't have 600 degrees." So then it turns it off and tries to slow it down. But until that happens, and it is some time lag, and that's why the rate was building up. The jets were on, and they were going to stay on due to that instantaneous 600 - suspected 600 degree per second rate. Over.

06 14 22 48 CMP

Okay. I got you.

06 14 22 50 CC

Roger.

06 14 22 51 CMP

Man.

06 14 23 24 LMP

Hey, Charlie, are you saying that for a short period of time, he actually loaded NOUN 20 with some value other than was being read by the CDU?

06 14 23 34 CC

I think I got that, Buzz. That's affirmative. But when he did that second VERB 24, you were - the NOUN was 20, so when he did the 3175 and then a 002 ENTER, what he actually did there was load the first two actual CDU locations, and the computer looked at it - the DAP looked at it as an instantaneous change in the actual CDU. Stand by on your comments. We're switching antennas.

06 14 24 03 LMP

Roger.

06 14 24 05 CC

- - We're very scratchy.

06 14 24 08 LMP

Okay.

06 14 24 43 CC

11, Houston. We got you back now on the high gain. Did you copy all that, Buzz? Over.

06 14 24 51 LMP

Yes. I think so. I - I thought maybe that NOUN 20 was one of those that you could never load from the DSKY, and that still maybe. Maybe it was loaded just for the short period of time, and then when the counters read the - the gimbal angles, why they changed it back to what they actually are. But in the meantime, the DAP saw this different number. Is that right?

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06 14 25 17 CC

Well, our guidance guy was telling me that you can actually load those ACDU's, the actual CDU's, but we'll - we're checking on that. Over.

06 14 25 30 LMP

Okay.

06 14 25 42 CC

11, Houston. Buzz, the word from the back room is that you can actually load the NOUN 20, but you should not.

06 14 25 55 LMP

Yes. I got that. Thank you.

06 14 25 57 CC

You're welcome.

06 14 33 30 CC

Apollo 11, Houston. We got a recommendation for you on your stowage of the EVVA's. Over.

06 14 33 39 LMP

Go ahead.

06 14 33 41 CC

Okay. We'd like - the SPAN guys say it looks - they think that one would go on the helmet that you're going to have in B1, and you could put the other one on Mike's helmet, which will be in the sleep restraint. Over.

06 14 34 01 CDR

I doubt if it will fit on the helmet in B1. The other one might - might go in the sleep restraint. We've got them in our helmet bags, and I guess we're going to have to keep the helmets in the helmet bags, and the LEVVA's in the LEVVA bags.

06 14 34 20 CC

Roger.

06 14 34 22 CDR

Yes. I've been thinking maybe they ought to stay sealed up.

06 14 34 26 CC

Okay. We - -

06 14 34 27 CMP

It won't hack B1, Charlie, with the cover. I tried it already.

06 14 34 31 CC

Okay. Fine. We weren't sure of that. It was just a suggestion. We thought we'd - You check it out. Sounds like you've already done that, so I guess whatever you can come up with, just let us know.

06 14 34 44 LMP

Okay. There's no problem. We'll let you know where they end up.

06 14 34 47 CC

Roger.

END OF TAPE

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06 15 49 04 CDR
Hello, Houston. Apollo 11.

06 15 49 06 CC
Go ahead, 11. Over.

06 15 49 10 CDR
Okay. Crew status report. Radiation: CDR 11020, CMP 10022, LMP 09024. No medication.

06 15 49 28 CC
Roger. Copy.

06 15 49 35 CC
And, Neil, we got - we'd like your onboard readouts of batteries and RCS. Over.

06 15 49 43 CDR
Okay.

06 15 50 54 CDR
Okay, Charlie. Ready to copy?

06 15 50 56 CC
Roger. Go ahead. Over.

06 15 50 59 CDR
Okay. BATT C, PYRO BATT A, and PYRO BATT B are 37.0. RCS A, 51; B, 63; C, 63; D, 59. Go.

06 15 51 14 CC
Roger. Copy all that, Neil. And we got an entry PAD if you're ready to copy. Over.

06 15 52 00 LMP
Houston, Apollo 11. Ready to copy. Over.

06 15 52 02 CC
Roger, Buzz. It's an entry PAD, MPL, starting with roll 05, 35 - correction - 359 152 001. GET 194 46 03 267, plus 1102, minus 17203, 068, NOUN 60, 36194 656 11894 36275 195 03 03 0027, NOUN 69, all four lines are NA. Picking up with D zero: 400 02 09. RET of blackout, 00 17 03 38 08 20. Sextant star, 02 0945 149. Boresight star is Scorpii theta, that's Scorpii theta. Up 315, right 35, lift vector up. And the comments: This entry PAD assumes no midcourse 6. And for your information, looking at it right now, based on all the tracking we got, that maneuver would only be a tenth of a foot per second. So, we'll probably skip it. We'll let you know more about that later. Okay. Your horizon check at EI minus 30 minutes, GET of 194 33 03, gives you a pitch angle of 298. Okay. The GDC, your backup align - Your set stars for the entry REFSMMAT are Deneb and Vega, 079 234 340. Standing by for your readback. Over.

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06 15 55 27 LMP
Roger. Lunar entry, MPL: 359 152 001 194 46 03 267, plus 1102, minus 17203 068 36194 656 11894 36275; 195 03 03 0027, four NA, 400 02 09 00 17 03 38 08 20 02 0945 149, Scorpii theta. Up 315, right 35, up. Assumes no MCC 6. Horizon at EI minus 30 194 33 03, and pitch 298. Set stars Deneb and Vega, 079 234 340. Over.

06 15 57 04 CC
Roger. Very good readback, Buzz, and for your communication setup for tonight's sleep, we'd like OMNI to OMNI. Stand by.

06 15 58 51 CC

Apollo 11, Houston. If you didn't copy that, Buzz, it was a good readback on the PAD. We've got a clock update for you that we'll have to you as soon as we can get it out to the site. We're in the process of handing over to Honeysuckle, and it will be a couple of minutes. Over.

06 15 59 11 LMP

Okay. You want the computer to BLOCK?

06 15 59 15 CC

We'll call you. You can stay BLOCK right now. We'll give you a call.

06 16 00 54 CC

Hello, Apollo 11. Houston. Would you please give us P00 and ACCEPT? We've got a clock update for you.

06 16 01 13 CMP

Go ahead, Charlie. We're P00 and ACCEPT.

06 16 01 21 CC

Roger.

06 16 03 19 CC

11, HOUSTON. We've got the load in. You can go back to BLOCK. Over.

06 16 03 26 CMP

Roger. Thank you.

06 16 03 32 CC

And 11, Houston. One final thing. We'd like you to select your OMNI to OMNI, OMNI A to Bravo, high gain track to MANUAL, and beam WIDE. Your angles are 270 in yaw, pitch minus 50. Over.

06 16 03 56 LMP

Roger. Fifty and minus 70.

06 16 04 04 CC

The angles, Buzz, were yaw 270, pitch minus 50. Over.

06 16 04 13 LMP

Okay. Yaw 270, pitch minus 50.

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06 16 04 19 CC

That's Roger.

06 16 04 27 CC

And Apollo 11, it's good night from a sleepy White Team. Over.

06 16 04 39 LMP

Roger. Thank you very much. We're not as sleepy tonight as we were last night.

06 16 04 46 CC

Yes. I guess you guys were pretty tired last night after that busy day.

06 16 04 54 CMP

That's affirmative. I couldn't even find the chlorine.

06 16 04 57 CC

(Laughing) Yes.

06 16 25 45 CC

Hello, Apollo 11. Houston. Sorry to bother you, but we'd like to have you do a VERB 34 to get the NOUN 65 off of there.
Over.

END OF TAPE

Tape 104/1 Page 564

REST PERIOD - NO COMMUNICATIONS

Tape 105/1 Page 565

REST PERIOD - NO COMMUNICATIONS

Tape 106/1 Page 566

REST PERIOD - NO COMMUNICATIONS

Tape 107/1 Page 567

REST PERIOD - NO COMMUNICATIONS

Tape 108/1 Page 568

REST PERIOD - NO COMMUNICATIONS

Tape 109/1 Page 569

REST PERIOD - NO COMMUNICATIONS

Tape 110/1 Page 570

07 02 59 56 CC

Apollo 11, Houston. Are you up and at them yet? Qver.

07 03 00 04 CDR

Well, we're up, at least, Owen.

07 03 00 09 CMP

Eyeballing my Magellanic clouds. Over.

07 03 00 12 CC

11, Houston. Got your signals loud and clear, here. How are things this morning? Over.

07 03 00 24 CDR

Do you read us, Owen?

07 03 00 27 CC

Roger. Loud and clear, 11.

07 03 00 31 CDR

Okay. Everything *** to be all right here. So far, we haven't been looking in the cockpit yet. We've been spending our time looking outside the cockpit. ***

07 03 00 42 CC

Roger, 11. You're breaking up just a little bit there, Neil. Your signals are loud but are breaking up occasionally. Your spacecraft all looks good here from the ground. We noticed you stirring around the cockpit and thought we'd give you a call. Over.

07 03 00 59 CDR

Good morning.

07 03 01 07 CC

11, Houston. We do have a few items for you here, entry PAD's, consumables, and so forth. After you've had a chance to get organized, whenever you're ready to start on a few of these items, why, we'll read them up to you. Over.

07 03 01 22 LMP

Okay. Stand by.

07 03 01 50 LMP

Go ahead, Owen. I've got the book now. I'm ready to copy.

07 03 01 52 CC

Okay, Buzz. On your flight plan items, a few updates first of all. We've cancelled midcourse number 6. Just remain - remain in PTC. I'll give you a little more time this morning. Second item on the flight plan is we're ready for a BATT B charge anytime you want to put it on the line; and third item, we'd like a waste water dump a little differently this time. We'd like

*** Three asterisks denote clipping of words and phrases.

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to do it on our marks from the ground. The PTC is a little bit ragged, and we would like to make the water dump at a time which we think will hold it in its proper configuration, so it looks like we'll have a desirable opportunity coming along in - between 15 and 20 minutes. And on our mark, we would like to have a waste water dump down to about 40 percent. I'll give you a more accurate level for the water dump a little later. Over.

07 03 02 53 LMP

Roger. You must have stayed up all night figuring this one out.

07 03 03 00 CC

11, Houston. Stand by just a moment here until we get out of the NO position on the antenna.

07 03 04 14 CC

11, Houston. We're over on OMNI Delta now. I think we can read you better. Did you get all those first three items on your flight plan update? Over.

07 03 04 25 LMP

I got midcourse correction cancelled; battery B charge and water dump on your call. Over.

07 03 04 35 CC

That's right, Buzz; and the last item here, we do request that we do a P52, even though we're not doing midcourse correction;

and we suggest you get to that after the waste water dump has been complete. We also have a state vector update for you, if you can give us P00 and ACCEP. Over.

07 03 05 09 LMP

Okay. You have the DSKY now.

07 03 05 12 CC

Roger. We'll be sending that up, and I'll give you your consumables update now. It's - for a time of 170 hours, your RCS total is minus 3.5 percent, Alfa is minus 14.5, Bravo plus 7, Charlie minus 4.5, Delta minus 3; hydrogen total is minus 1, and your oxygen total is plus 24. Over.

07 03 05 50 CMP

Roger. Copy those. And onboard readouts, D is 69, C is 73, D is - Let me start over again. Okay. A is 51 and B is 62; C is 63 and D is 59. Over.

07 03 06 47 CC

Roger, 11. Copy those, and we've checked them here on the ground, also. One correction to my last transmission. We would like that P52 prior to the waste water dump, which is coming up in about 30 minutes from now. Will that be possible? Over.

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07 03 07 03 CMP

Oh, yes. We'll take care of that.

07 03 07 07 CC

Roger. And if you're ready for an entry PAD, I'll read that up to you now, also, 11.

07 03 07 16 CMP

Ready to copy.

07 03 07 19 CC

Okay. Entry PAD is area MIDPAC: 359 153 001 194 46 03 267, plus 1102, minus 17203 067 36194 655 11875 36275 195 03 03 00 28; DL and VL, all four are not applicable; DO, 4 00 02 10 00 18 03 38 08 21 44 2932 380; boresight star is Scorpio Theta, up 314, right 34, lift vector up. Comments: Entry data assumes no midcourse maneuvers. Your earth entry: minus 30 minutes; horizon check, 194 plus 33 plus 03. Your pitch is 297. This assumes an entry REFSMMAT. Your GDC align stars are Deneb and Vega. Roll, pitch, yaw, 078, 233, 340. Read back. Over.

07 03 09 57 CMP

Roger. MIDPAC entry PAD: 359 153 001 194 46 03 267, plus 1102, minus 17203 067 36194 655 11875 36275 195 03 03 0028, DL and VL NA, 4 00 02 10 00 18 03 38 08 21 44 2932 380, Scorpii Delta - Scorpii Theta, up 314, right 34, up. No midcourse correction, horizon, TI minus 30, 194 33 03, pitch 297, Deneb and Vega, 078, 233, 340. Over.

07 03 11 17 CC

11, Houston. That's Roger. Copy. 11, it's also your computer. You can go back to BLOCK.

07 03 11 28 CMP

Roger.

07 03 18 51 CDR

Okay, Houston. The crew status report is 8 1/2, 7, and 8.

07 03 19 00 CC

11, Houston. Roger, Neil. 8 1/2, 7, and 8 for your crew status.

07 03 19 08 CDR

Right.

07 03 19 13 CC

11, Houston. Your P52 looks good here on the ground, and we are now estimating that water dump will occur along about 171

plus 40; and we'd like for you to dump to 45 percent. This should let you arrive at Earth interface with just about a full load of waste water. Over.

07 03 19 37 CDR

Understand 171 40, approximately, 40 percent.

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07 03 22 14 CC

11, Houston. We'd like to advance the time on that water dump to about 171 plus 30 just after we reacquire on the next OMNI, and - as I mentioned, it'll be down to 45 percent - is the new quantity. Also, we're standing by for your CM RCS ejector temperature readout. Over.

07 03 25 38 CC

Apollo 11, Houston. I'm not certain you copied my last transmission, as we were just in the process of switching OMNI's. We'd like to advance the time on that water dump until about 5 minutes from now. And we'll give you a precise mark on the time to start the dump, and we are standing by for a readout on your CM RCS ejector temperatures. Over.

07 03 26 00 CMP

Okay, Owen. We're standing by for your mark, and stand by for the readout.

07 03 26 03 CC

Roger.

07 03 26 40 CMP

Houston, Apollo 11. Are you ready to copy ejector temperatures? I'll read them in volts.

07 03 26 46 CC

That's affirmative. Go ahead, Mike.

07 03 26 49 CMP

Okay. 2 4 is reading 4.7 volts, 2 5 is reading 4.8 volts, 1 2 is reading 4.8 volts, 1 4 is reading 4.8, 1 6 4.5, and 2 1 4.8. Over.

07 03 26 52 CC

11, Houston. Roger. Those - I got them all.

07 03 29 46 CC

Apollo 11, Houston. We're ready for you to start your waste water dump at this time. Over.

07 03 33 00 CMP

Roger. Dumping.

07 03 33 30 CC

Apollo 11, Houston. We show you - -

07 03 33 32 CMP

Houston, Apollo 11. We've dumped to 45 percent, and we're stopping now. Do you concur?

07 03 33 37 CC

Roger, 11. We concur.

07 03 53 35 CC

Apollo 11, Houston. I can read up your forecast weather for the recovery any time you'd like to hear about it. Over.

07 03 53 45 LMP

Go ahead.

Tape 110/5 Page 574

07 03 53 47 CC

11, Houston. Present forecast shows acceptable conditions in your recovery area: 2000 foot scattered, high scattered, wind from 070 degrees, 13 knots, visibility 10 miles, and sea state about 4 feet. The forecast yesterday showed a tropical storm, Claudia, some 500 to 1000 miles east of Hawaii. The - the pictures from Earth satellites taken yesterday afternoon - afternoon showed Claudia dissipating, so this appears to be even less a factor than it was before. Your recovery area is now believed to be just a little ways north of the intertropical convergence zone, which you can probably see when you look out your windows there. Yesterday there was also a report of a tropical storm, Viola, further to the west. Its present location is some thousand miles east of the Phillipines and moving northwest. Tropical storm Viola has been intensifying, and should be transferred to the typhoon category within the next 12 hours or so; however, that will be far to your west. As a matter of fact, sunrise terminator has not yet reached Viola. When it does several hours from now, you can probably distinguish it from your viewpoint quite readily. As a matter of fact it should be of interest to perhaps take some pictures. Comment on it when you get a chance to see Viola in a few hours. So that's about the present weather state and situation for your recovery area. Over.

07 03 55 40 CMP

That sounds pretty good ...

END OF TAPE

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07 04 17 16 CC

Apollo 11, Houston. Over.

07 04 17 22 CDR

Go ahead, Houston.

07 04 17 24 CC

11, Houston. We'd like to try operation with the high gain array here. If you would select reacquire and your S band antenna to HIGH GAIN, your positions are pitch plus 40 and yaw 270, and then monitor for acquisition. Over.

07 04 17 48 CMP

Okay. It's in work.

07 04 21 25 CC

11, Houston. We're just now ready to switch from OMNI Delta over to your high gain antenna. Can you confirm that you have gone to REACQ? Over.

07 04 21 35 CMP

Confirmed.

07 04 23 04 CC

That looks real good, Mike. Looks like we picked up about 30 dB on the signal strength.

07 04 23 11 CMP

Yes. It came in quite quickly. However, I'm showing about 240 yaw and about zero on pitch, now.

07 04 23 22 CC

Roger. About 240 and 0.

END OF TAPE

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07 05 35 23 CC

Apollo 11, Houston. Over.

07 05 35 28 CDR

Go ahead.

07 05 35 29 CC

Roger. Just wanted to make sure you fellows hadn't gone back to sleep again. And I also have a little bit of late news here if you'd like to find out what's happened in the last 12 - 14 hours. Over.

07 05 35 42 CDR

Okay. Go ahead.

07 05 35 44 CC

Okey doke. Hot off the press here: We find Juan Carlos was formally designated yesterday - Tuesday - to become General Franco's successor - as the Chief of State of Spain and eventual King. Juan Carlos will be sworn in today as his successor designate after taking an oath of loyalty to the law and the National Movement, Spain's only legal political organization. He will apparently be called the Prince of Spain.

07 05 36 14 CC

House Ways and Means Committee also has agreed yesterday to tax changes affecting oil companies, also banks and utilities, which could add as much as 2 billion dollars per year to the federal revenue. The committee also voted tentatively to change the accounting procedures for telephone, electric, gas, and oil pipeline companies and to reduce tax benefits of mutual savings and loan institutions. So, it looks as if tax reform may be on the way.

07 05 36 42 CC

Looking overseas, we find South Korea's first super highway, linking Seoul with the Port of Inchon, has been named the Apollo Highway to commemorate your trip. I think we mentioned last night that President Nixon has already started on his round the world trip, and today he is in San Francisco on his first stop which will take him to the U.S.S. Hornet, from which he'll watch the return of your spacecraft. He plans to visit seven nations including Rumania during this trip. He, as I think you also knew, had to miss the All Star baseball game yesterday, as it was rained out; but it is being played today.

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07 05 37 28 CC

The West Coast residents in Seattle, Washington; Portland, Oregon; Vancouver, British Columbia; and San Francisco all plan to make their areas visible to the three of you by lighting their lights between 9 pm and midnight tonight, according to the Associated Press. We do have clear weather predicted there, so you may be able to see Christmas lights, porch lights, store lights, and whatever may be turned on.

07 05 37 38 CDR

Good show.

07 05 37 39 CC

A little closer to home here, back in Memphis, Tennessee, a young lady who is presently tipping the scales at 8 pounds, 2 ounces, was named "Module" by her parents, Mr. and Mrs. Eddie Lee McGhee. "It wasn't my idea," said Mrs. McGhee, "It was my husband's." She said she had balked at the name Lunar Module McGhee, because it didn't sound too good, but apparently they have compromised on just Module. Over.

07 05 38 29 SC

(Laughter) ...

07 05 38 32 CC

Roger. Hear a few chuckles coming from that direction. And we do have a late report on the sports here also. The All Star game currently being played. The present score at the end of the fourth inning has the National League leading the American League by 9 to 3. So the hitters are having a good day, you can tell.

07 05 38 54 CC

And rain clouds are over the MSC area at the moment. It began raining here just about 10 minutes ago, and last report, we were having a pretty heavy deluge. So, that's it from the news front for the afternoon here, Apollo 11. Over.

07 05 39 19 CDR

Thank you very much, Owen. I think my yard could use some water.

07 05 39 23 CC

That's very true. I've forgotten exactly how many days it did go, Buzz, but something like 30 days without rain; and we can appreciate the rain we're getting right now.

Tape 112/3 Page 578

07 05 39 34 LMP

That was Neil. This is Buzz, here. I wish we could find out when the last time my lawn was cut. Over.

07 05 39 39 CMP

That might be a little more difficult to find out. I'm not sure whether the - whether Mike is ready to admit when he last did the job, but I'll look into that for you.

07 05 39 51 LMP

Well, he'll tell you. He's got a new mower.

07 05 39 53 CC

Roger.

07 05 40 04 CMP

Hey, ask my chinch bugs how they're toing?

07 05 40 07 CC

Well, I'm not sure about your's. I can let you know about my own, and the report isn't very good.

07 05 47 45 CC

11, Houston. Over.

07 05 47 50 LMP

Go ahead.

07 05 47 51 CC

Roger. Joan wasn't home right now, Buzz, but Janis reports the grass is getting pretty high, and I would estimate that it's going to be close to your knees by the time you get out of quarantine. Over.

07 05 48 08 LMP

Okay. I'll have to schedule a little discussion after I get back.

07 05 48 13 CC

Roger. And no reports - no report from the chinch bugs there, Mike.

07 05 48 21 CMP

Well, they're sort of taciturn little fellows. They don't say much; they just chomp away.

07 05 48 26 CC

Concur on that.

07 05 48 47 CMP

Which is about what we're doing up here.

07 05 48 52 CC

We concur on that, too.

07 05 49 18 CMP

Breakfast was magnificent as usual. I had sliced peaches, sausage patties, two cups of coffee, and I forget all what else.

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07 05 49 27 CC

That does sound pretty good. As a matter of fact, I'm way overdue for a meal myself, here. I could use some of that.

07 05 49 50 CMP

Why don't you get Milt to give you 5 minutes off and grab a hamburger?

07 05 50 00 CC

I suggested that awhile ago. He was pointing out about the weight problem here. We've got to keep the calories low, so I'd better stand by without it.

07 05 52 46 CMP

Houston, Apollo 11. We've been doing a little flight planning for Apollo 12 up here.

07 05 52 54 CC

Roger. Go ahead.

07 05 52 57 CMP

We're trying to calculate how much spaghetti and meatballs we can get on board for Al Bean.

07 05 53 05 CC

I'm not sure the spacecraft will take that much extra weight. Have you made any estimates?

07 05 53 12 CMP

It'll be close.

07 05 55 52 CC

11, Houston. The medics at the next console report that the shrew is one animal which can eat six times its own body weight every 24 hours. This may be a satisfactory base line for your spaghetti calculations on Al Bean. Over.

07 05 56 11 CMP

Okay. Thank you. That's in work.

07 05 59 15 CMP

Houston, Apollo 11. It was slightly colder in here last night than it has been on any previous night. Does EECOMM notice any change in his data or any explanation for that?

07 05 59 25 CC

Roger. Stand by just a moment. We've got to check some temperatures.

07 05 59 35 CMP

Up until last night it was - if anything, a little on the warm side at night. Last night it was on the chilly side.

07 05 59 43 CC

Roger there. We'll run down the temperatures for the 2 nights.

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07 05 59 50 CMP

Oh, it's no big thing. Just as a matter of interest.

07 05 59 52 CC

Roger.

07 06 00 05 CMP

And how'd you like the command module RCS temperatures?

07 06 00 17 CC

11, Houston. They all look very good. The lowest temperature was 40 degrees, and we're taking a look at your cabin temperatures now.

07 06 00 27 CMP

We agree on the CM RCS. No heaters are going 2 to be required by a country mile.

07 06 00 38 CC

We think that's correct.

07 06 00 50 CMP

We don't like those heaters, anyway, working off the direct coils.

07 06 00 53 CC

Roger.

07 06 01 34 CMP

Peculiar thing, Owen, on the platform alignment is that when I really take my time and do a very slow, careful, precise job of marking. I'm getting about the same star angle difference as when I'm doing it in DTC and have to do a hurried rush job with relatively poor tracking. Star angle differences seem insensitive. It almost made me believe there's a very small bias there somewhere in the sextant.

07 06 02 07 CC

Roger, 11. Perhaps the 3 degrees per second just isn't that much of a bother. Over.

07 06 02 16 LMP

Well, he's really trying to explain why he can't get all zeros.

07 06 02 20 CMP

I think Buzz is probably right. As a matter of fact, one time I made a mark which I thought was a little bit in error, but I thought, "Well heck. I'll go ahead and see how it works out anyway," and I got five zeros that time. And when I have thought everything was exactly precisely on, I have consistently been getting 0.01.

Tape 112/6 Page 581

07 06 02 52 CC

Roger. Apparently it pays to hurry.

07 06 02 59 CMP

I usually do.

07 06 03 07 CMP

The visibility through the telescope has been very poor. It's, I would say, even worse than the simulator is right now. It requires long periods of dark adaptation which most times are most inconvenient; so it's really a tremendous asset to keep the platform powered up at all times and to keep it tweaked within the capability of the sextant field of view.

07 06 03 37 CC

Understand, Mike.

07 06 05 07 CC

11, Houston. Checking your temperatures, it does look like the spacecraft may have cooled down perhaps 2 or 3 degrees in the last 24 hours, and that sounds to be consistent with your report on the comfort level there. Over.

07 06 05 25 CMP

Okay.

07 06 05 29 CDR
Is that a LM off phenomenon?

07 06 05 59 CC
11, Houston. It looks like we'll have to think a little more about that, as to whether it's a LM off or some effect of being out of Lunar orbit. We don't know, so we'll have to puzzle before we can give a better answer.

07 06 06 12 CDR
Okay.

07 06 06 15 CMP
Well, if the systems guys have anything they want chased down, we'll be happy to give you any readings or reports or what have you.

07 06 06 23 CC
Roger. We'll think about that and see if there aren't some other tests to be usefully performed here.

07 06 06 31 CMP
Okay.

07 06 13 09 CC
11, Houston. I'll be turning things over to the Green CAP COMM at this time, and see you on the ground tomorrow.

Tape 112/7 Page 582

07 06 13 25 CDR
Okay, Owen. I want to thank you and the whole Purple/Maroon group there for a good job helping Apollo 11.

07 06 13 35 CC
Thank you, sir.

07 06 13 41 LMP
Thanks from us to all of you. It was really appreciated.

07 06 13 45 CMP
Great job, you guys.

07 06 13 50 CC
Roger, out.

07 06 26 30 CC
Apollo 11, this is Houston. Over.

07 06 26 34 CMP
Go ahead, Houston. Apollo 11.

07 06 26 37 CC
11, this is Houston. With reference to your subjective evaluation that it felt cooler in side the spacecraft last night, we reported earlier that we did indeed see a drop of about 3 degrees over the previous night. Looking back, it appears the crew of Apollo 10 reported similar feelings during the translunar and transearth coast phases. We're wondering if you could give us any indication of the relative amounts of free or condensed water in the cabin last night and the night before from which we could infer humidity. Over.

07 06 27 27 CDR
Roger. That might be a little bit difficult to do. We'll take a look at the tunnel now. It does seem as though, between the dirt, we had a little bit more moisture in the tunnel. Of course, the LM hadn't been vented when we did translunar.

07 06 27 45 CC

Roger. We were more curious about the relative amount of moisture between, say, last night and the night before, both of which would have the LM missing.

07 06 28 04 CMP

There's more moisture in the tunnel now than there has been at any previous time. Subjectively we have been unable to determine any change in - any buildup in humidity. There appears to be no moisture any other place in the spacecraft. For example, the windows are not fogging or - and various other cool spots around the spacecraft - all of them appear to be completely dry.

Tape 112/8 Page 583

07 06 28 35 CC

This is Houston. Roger. Thank you.

07 06 42 07 CMP

How are all the "Greens" today, Bruce?

07 06 42 14 CC

Oh, the Greens are in good shape. The actual Green Team has been here for several hours. We're dogging the watch down here to position Ron for entry. Over.

07 06 42 25 CMP

Roger. Understand. Did Dave Reed get to explain the lunar ... at the press conference?

07 06 42 32 CC

No, but your comments about Bill Shaffer and the explanations were quoted in the paper last night.

07 06 42 40 CMP

Oh, oh.

07 06 42 45 CC

Do you want to say anything more while you're on the line?

07 06 42 51 CMP

He's right. He's absolutely right.

07 06 44 05 CMP

How's old White, Bruce? Did he ever let you go get a cup of coffee when we were over on the back side?

07 06 44 15 CC

Oh, things have been going pretty smoothly down here. He's really not that hard to get along with.

07 06 44 21 CMP

Oh, he must be mellowing.

07 06 44 23 CC

We've only got two of them back here right now.

07 06 44 30 CMP

He always used to make me sit at the console through the back side passes, just for training.

07 06 44 41 CC

Well, the word we have here is - that was because whenever you came back, you had to be retrained.

07 06 44 50 CMP

Touché.

07 06 51 08 CMP

Houston, Apollo 11. Out of curiosity, on those 70 mm cameras, we figure we exposed around 300 in the LM and around a thousand in the command module; and both cameras - or all the 70 mm cameras worked just fine.

07 06 51 26 CC

Okay. Very good. Thank you.

END OF TAPE

Tape 113/1 Page 584

07 07 07 14 CC

Apollo 11, this is Houston. Over.

07 07 07 19 CMP

Go ahead, Houston.

07 07 07 21 CC

11, this is Houston. Do you all have "Change Lima" for your entry operations checklist dated July 23? Over.

07 07 07 34 CDR

Dated when?

07 07 07 36 CC

July 23.

07 07 07 39 CDR

I'm not sure that we hung around long enough to pick that one up.

07 07 07 44 CC

Okay. If you've got the entry operations checklist handy, then I'll pass it up to you. Over.

07 07 07 53 CDR

How can you make changes after lift off?

07 07 08 04 CMP

You sure you don't mean June?

07 07 08 06 CC

Negative. It just came up today. Over.

07 07 08 12 CMP

So, you're the first to get to us. Go ahead.

07 07 08 18 CC

Okay. On page 6 1 of the entry out checklist down toward the bottom after "MAIN DEPLOY pushbutton," we have three additional steps we'd like you to accomplish. The intent of this is to reduce the oxygen pressure in your manifold and to eliminate the oxygen bleed flow through the potable and waste water tanks during descent. Over.

07 07 08 56 CMP

Okay. We've got 6 1 out. Go ahead.

07 07 09 00 CC

Okay. Down at the bottom, you've got "10,000 feet MAIN PARACHUTE DEPLOY, MAIN DEPLOY pushbutton, PUSH within 1 second." And after that step, we'd like you insert "SURGE TANK O2 valve, OFF; REPRESS PACKAGE valve, OFF; and DIRECT O2 valve, OPEN." Do you copy?

07 07 09 49 CMP

Okay. Down at the bottom, after "MAIN DEPLOY pushbutton, PUSH; SURGE TANK O2, OFF; and REPRESS PACKAGE VALVE, OFF, DIRECT O2, ON" Over.

Tape 113/2 Page 585

07 07 10 04 CC

Roger. And then down at the very bottom of page 6 2 where you see "DIRECT O2, OFF VERIFY," delete that step completely. Over.

07 07 10 20 CMP

Roger.

07 07 10 22 CC

And for record purposes, this will be "Change Lima." Over.

07 07 10 30 CMP

Okay. We've got it. How far open do you want this the DIRECT O2 valve to be opened at this point? I guess you want it - just leave it open from that point on?

07 07 10 46 CC

Roger. It should go all the way open, and you can just leave it on from that point on. The intent is to completely depressurize the oxygen manifold. Over.

07 07 10 59 CMP

Roger. Copy.

07 07 15 34 CC

Apollo 11, this is Houston. For your information the All Star game has just ended with the National League winning 9 to 3 over American. Over.

07 07 15 48 CDR

Roger. Thank you.

07 07 15 52 CC

And I have a message here for Mike that says "All the chinch bugs are gone." Over.

07 07 16 05 CMP

Having done their job I guess.

07 07 16 10 CC

Well, along with one tree, it turns out.

07 07 16 15 CMP

Yes. I heard about that. That was right before the flight.

07 07 16 18 CC

Right. That big storm.

07 08 23 55 CC

Apollo 11, this is Houston. Are you still up there? Over.

07 08 24 07 CDR

Yes, we are. But not quite so far as we were a while ago.

07 08 24 12 CC

Roger. We concur. We just wanted to make sure that we had good COMM with you.

07 08 24 18 CDR

Okay.

Tape 113/3 Page 586

07 08 26 26 CC

For general information, 11, you are now 95,970 miles out from the Earth. Over.

07 08 26 39 CDR

Right in our own back yard.

07 08 26 41 CC

Say again.

07 08 26 46 CDR

Right in our own back yard.

07 08 26 54 CC

Roger that.

07 08 27 03 LMP

Trying to come down hill a little bit now. What's our velocity?

07 08 27 12 CC

Your velocity is 5991 feet per second.

07 08 27 20 LMP

Thank you.

07 08 27 21 CC

And you are indeed coming down hill.

END OF TAPE

Tape 114/1 Page 587

07 09 08 35 CC

Apollo 11, this is Houston. Over.

07 09 08 42 CMP

Go ahead, Houston.

07 09 08 45 CC

Roger, 11. I've got a flight plan update for you to give you an optimum attitude for the Earth in the number 1 window and the Moon in number 5 window. Over.

07 09 09 00 CMP

Ready to copy.

07 09 09 03 CC

Roger. Your attitude will be roll 12 degrees, pitch 270 degrees, yaw 0 degrees. High gain antenna angles, pitch plus 14, yaw 263. Over.

07 09 09 25 CMP

Roger. I copy. Roll 012, pitch 270, yaw 0. High gain antenna, pitch plus 14 and yaw 263.

07 09 09 35 CC

Roger. And when coming out of PTC, you might be advised that your deadband has been collapsed, so follow the checklist items. Over.

07 09 09 46 CMP

Roger that.

07 09 12 23 CC

11, this is Houston. We're receiving a black signal from you right now, but we are getting TV. Over.

07 09 24 10 CC

Apollo 11, this is Houston. Over.

07 09 24 14 CMP

Go ahead.

07 09 24 16 CC

From signal strength indications, it appears that we may be locked up on a side lobe with a high gain antenna. We'd like you to go into wide bandwidth for about 15 seconds and then back to narrow. Over.

07 09 24 29 CMP

All right.

07 09 31 18 CDR

You have good S band signal strength now, Houston?

07 09 31 22 CC

That's affirmative, 11.

07 09 31 29 CDR

You all set for TV?

07 09 31 35 CC

Roger. We're all set whenever you're ready to send.

Tape 114/2 Page 588

07 09 31 39 CDR

Okay.

07 09 31 52 CC

Okay. You're coming through loud and clear now, 11, with your patch.

07 09 32 24 CDR

Good evening. This is the Commander of Apollo 11. A hundred years ago, Jules Verne wrote a book about a voyage to the Moon. His spaceship, Columbia, took off from Florida and landed in the Pacific Ocean after completing a trip to the Moon. It seems appropriate to us to share with you some of the reflections of the crew as the modern day Columbia completes its rendezvous with the planet Earth and the same Pacific Ocean tomorrow. First, Mike Collins.

07 09 33 35 CC

11, this is Houston. We have an LOS here.

07 09 33 39 CDR

We'll be right back with you.

07 09 33 40 CC

Roger.

07 09 33 51 CC

In the interim, you may be interested in knowing that Jan and the children and Pat and the youngsters and Andy Aldrin are down here in the viewing room watching this evening.

07 09 34 05 CDR

We're glad to hear that.

07 09 34 38 CC

Okay, 11. You're back on, with Mike in the middle of the screen there.

07 09 34 44 CMP

Roger. This trip of ours to the Moon may have looked, to you, simple or easy. I'd like to assure you that has not been the case. The Saturn V rocket which put us into orbit is an incredibly complicated piece of machinery, every piece of which worked flawlessly. This computer up above my head has a 38,000 word vocabulary, each word of which has been very carefully chosen to be of the utmost value to us, the crew. This switch which I have in my hand now, has over 300 counterparts in the command module alone, this one single switch design. In addition to that, there are myriads of circuit breakers, levers, rods, and other associated controls. The SPS engine, our large rocket engine on the aft end of our service module, must have performed flawlessly, or we would have been stranded in lunar orbit. The parachutes up above my head must work perfectly tomorrow or we will plummet into the

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ocean. We have always had confidence that all this equipment will work, and work properly, and we continue to have confidence that it will do so for the remainder of the flight. All this is possible only through the blood, sweat, and tears of a number of people. First, the American workmen who put these pieces of machinery together in the factory. Second, the painstaking work done by the various test teams during the assembly and retest after assembly. And finally, the people at the Manned Spacecraft Center, both in management, in mission planning, in flight control, and last, but not least, in crew training. This operation is somewhat like the periscope of a submarine. All you see is the three of us, but beneath the surface are thousands and thousands of others, and to all those, I would like to say, thank you very much.

07 09 37 52 CC

11, this is Houston. We're getting a good picture of Buzz now, but no voice modulation. And would you open up the f stop on the TV camera; try 22, please?

07 09 38 13 CC

That appears to be a lot better now. We're still not receiving Buzz's audio.

07 09 38 20 LMP

Good evening. I'd like to discuss with you a few of the more symbolic aspects of the flight of our mission, Apollo 11. As we've been discussing the events that have taken place in the past 2 or 3 days here on board our spacecraft, we've come to the conclusion that this has been far more than three men on a voyage to the Moon; more, still, than the efforts of a government and industry team; more, even, than the efforts of one nation. We feel that this stands as a symbol of the insatiable curiosity of all mankind to explore the unknown. Neil's statement the other day upon first setting foot on the surface of the Moon, "This is a small step for a man, but a great leap for mankind," I believe sums up these feelings very nicely. We accepted the challenge of going to the Moon; the acceptance of this challenge was inevitable. The relative ease with which we carried out our mission, I believe, is a tribute to the timeliness of that acceptance. Today, I feel we're fully capable of accepting expanded roles in the exploration of space. In retrospect, we have all been particularly pleased with the call signs that we very laboriously

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chose for our spacecraft, Columbia and Eagle. We've been particularly pleased with the emblem of our flight, depicting the U.S. eagle bringing the universal symbol of peace from the Earth, from the planet Earth to the Moon; that symbol being the olive branch. It was our overall crew choice to deposit a replica of this symbol on the Moon. Personally, in reflecting on the events of the past several days, a verse from Psalms comes to mind to me. "When I consider the heavens, the work of Thy fingers, the moon and the stars which Thou hast ordained, what is man that Thou art mindful of him."

07 09 41 42 CDR

The responsibility for this flight lies first with history and with the giants of science who have preceded this effort; next with the American people, who have through their will, indicated their desire; next, to four administrations, and their Congresses, for implementing that will; and then, to the agency and industry teams that built our spacecraft, the Saturn, the Columbia, the Eagle, and the little EMU, the space suit and backpack that was our small spacecraft out on the lunar surface. We would like to give a special thanks to all those Americans who built the spacecraft, who did the construction, design, the tests, and put their - their hearts and all their abilities into those crafts. To those people, tonight, we give a special thank you, and to all the other people that are listening and watching tonight, God bless you. Good night from Apollo 11.

07 09 43 52 CC

11, this is Houston. We're getting a zoom view out the window now.

07 09 44 24 CDR

Apollo 11, signing off.

07 09 47 48 CMP

Houston, Apollo 11. Do you want to crank up PTC again; do you have some reason to hold its attitude, or what's your pleasure?

07 09 47 57 CC

You can crank up PTC again, Mike, any time you like. And I might add I thought that was a mighty fine TV presentation. There's certainly nothing I can add to it from down here.

07 09 48 10 CMP

Thank you.

07 09 53 27 CC

Apollo 11, this is Houston. Over.

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07 09 53 33 CDR

Go ahead.

07 09 53 36 CC

Okay, 11. I've got a few small items here: one flight plan update and some entry photography information, if you are ready to copy. Over.

07 09 53 49 CDR

Go ahead.

07 09 53 51 CC

Roger. At 180 hours 50 minutes GET, we should like to delete your oxygen fuel cell purge.

07 09 54 02 CDR

Okay.

07 09 54 03 CC

And on the entry photography, if you are going to use a fresh magazine of color interior film, we recommend the following exposure settings: f11 at 1/250, six frames per second, focus on 7 feet for the fireball; f2.0, 1/60 of a second, six frames per second, focus on 50 feet when the chutes open. If you are using a magazine, part of which has already been used for interior shots, we recommend f16 at 1/500 of a second, six frames per second, focus on 7 feet for the fireball; f2.8, 1/60 of a second, six frames per second, focus on 50 feet when the parachutes open. And we would like to know the magazine number that you are intending to use if you have a chance. Over.

07 09 55 22 CMP

Okay. I think we got those. We will be using a fresh one and it will be color interior. Over.

07 09 55 32 CC

Roger. When you get - get it out, we would like to have the number of the magazine and the letter of the magazine relayed down.

07 09 55 42 CDR

Okay. And we're thinking that we might want to run some of that at 12 frames per second. And I think we can get everything from 0.5 - 0.5g down; that will only give us about 7.8 minutes and ... frames ... double that. I guess maybe just an occasional burst to 12 frames would be what we want and the rest of it at six. Over.

07 09 56 23 CC

This is Houston. That plan sounds fine with us, Neil.

07 09 56 28 CDR

Okay.

07 09 56 30 CC

And lastly, we would like to know if your stowage configuration for entry is going to conform to

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the nominal. The RETRO's down here are anxious to get an accurate c.g. computed for you, and in particular, where the LEVVA's are being stowed. Over.

07 09 56 53 CDR

Okay. We think we are going to put the LEVVA's and helmets in the hatch bag, and we'll let you know any other nonstandard stowage locations that we complete this evening.

07 09 57 08 CC

This is Houston. Roger. Out.

07 10 06 57 CDR

Houston, Apollo 11.

07 10 07 01 CC

Go ahead, 11.

07 10 07 03 CDR

Roger. The magazine we'll be using for entry tomorrow is magazine M. Over.

07 10 07 10 CC

Roger. Understand. Magazine M as in Mike.

07 10 07 14 CDR

That's right.

07 10 07 19 CC

Thank you. Out.

END OF TAPE

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07 10 17 38 CC

Apollo 11, this is Houston. Your friendly Green Team going off for the night, and going off for the last time. We wish to bid you a good night and Godspeed.

07 10 17 51 CDR

Thank you. We appreciate all that fine work done by the Green Team, and we'll be thanking you in person when we get back.

07 10 18 00 CC

Roger. We'll see you on the ground.

07 10 18 03 LMP

Really enjoyed working with all of you. Thanks very much. Over.

07 10 18 08 CC

Roger.

07 10 18 09 CMP

As usual, all you Greenies.

07 10 18 11 CC

They're all smiles down here, even the trench.

07 10 40 30 CMP

Houston, Apollo 11.

07 10 40 35 CC

Apollo 11, this is Houston. Over.

07 10 40 39 CMP

Roger. How's our thruster firing activity? We're about ready to crank up PTC if you are.

07 10 40 46 CC

Roger. Go ahead.

07 10 40 49 CMP

Okay. Thank you.

07 10 56 51 CC

Apollo 11, this is Houston. Over.

07 10 56 55 CDR

Go ahead, Houston.

07 10 56 57 CC

11, we'd like you to shift to an OMNI antenna configuration at the present time. We're requesting the S band antenna OMNI switch to Bravo and the S band antenna OMNI switch to OMNI. The high gain antenna track in MANUAL. Pitch minus 50, yaw 270. Over.

07 10 57 25 LMP

Roger. I'll do that right now.

07 10 57 30 CC

Roger. And if Mike has a minute, we'd like to do a little bit of troubleshooting. It seems he's either flat chested or something because we've lost respiration rate on the BIOMED telemetry. That is, the ZPN trace down here is flat.

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07 10 57 56 LMP

He was shaving a little bit ago. He might have just let it slip. Hold on a moment.

07 10 58 06 CMP

All the blasted wires are all connected, is all I know.

07 10 58 11 CC

Okay, Mike. We had a request that you disconnect the yellow connector from the signal conditioner and verify that it looks okay, reconnect it and then, if you would, check the two electrodes that are placed one on each side of your lower rib cage. Over.

07 10 58 36 CMP

I bet you there's a smile on Charlesworth's face.

07 10 58 41 CC

Cliff is not on right now. Gene Kranz just relieved him a few minutes ago.

07 10 58 50 CMP

Roger that.

07 10 59 56 CMP

All those wires and things look normal up here.

07 11 00 00 CC

Roger, Mike. We could see variations on our traces. You've connected and disconnected, but the medics still don't have a signal.

07 11 00 16 CC

Looks like you're sending us a message of some sort.

07 11 00 29 CMP

Well, I promise to let you know if I stop breathing.

07 11 03 23 CC

Apollo 11, Apollo 11, this is Houston broadcasting in the blind. Request OMNI Bravo. Request OMNI Bravo. Over.

07 11 10 45 CC

Apollo 11, this is Houston. Communication reestablished.

07 11 10 51 SC

...

07 11 11 51 CC

Apollo 11, this is Houston. Will you confirm you're in OMNI Bravo? Over.

07 11 12 08 LMP

Okay. That ought to give it to you.

07 11 12 12 CC

Roger. Out.

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07 11 14 51 CC

Apollo 11, this is Houston. Mike, we're still getting a flat trace on you for the impedance pneumograph. Before you turn in this evening, you might try putting some fresh paste in the sensors, and if that doesn't work, the medics have agreed to forget about it. Over.

07 11 15 17 CDR

Mike's off the loop right now. I'll convey that message.

07 11 15 20 CC

Okay. Thank you.

07 11 15 46 CMP

Houston, Apollo 11. Say again.

07 11 15 50 CC

Roger, Mike. The trace on your respiration rate is still flat. If you have time this evening before turning in, we would suggest that you try putting some fresh paste in the two electrodes that go on the side of your lower rib cage; and if that doesn't work, just give up on it.

07 11 16 13 CMP

...

END OF TAPE

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07 12 07 45 SC

(Sound of Train)

07 12 08 17 CC

Hey, 11, this is Houston. You might tell Buzz not to exercise quite so strenuously. Over.

07 12 08 30 LMP

What's the problem?

07 12 08 32 CC

Say again.

07 12 08 36 LMP

What's the problem?

07 12 08 42 CC

Okay. That's one - that's one on us. (Laughter)

07 12 09 19 CC

11, Houston. Seriously, that comment was just aimed at your musical selection.

07 12 09 26 LMP

Okay.

07 12 09 39 SC

(Sound of train)

07 12 09 59 CMP

Come on Neil, not so fast.

07 12 10 05 SC

(Sound of train)

07 12 10 19 CMP

You have an ergometer up here.

07 12 10 30 CC

What was that? Real time exercise?

07 12 10 35 CMP

Just trying to be your ergometer.

07 12 10 37 CC

Roger.

07 12 21 22 CC

Apollo 11, this is Houston. Over.

07 12 21 28 CDR

Go ahead, Houston.

07 12 21 30 CC

We'd like to know what your plans are as far as turning in this evening. Our - in the flight plan we show you commencing a rest period at about 182 hours, and what are you planning to do on that? We're going to be watching the weather here, and we expect to have an update on the weather, I guess, in about half hour or 45 minutes to pass to you. Over.

07 12 21 57 CDR

We're going to probably stick with the flight plan pretty much. We are going to - if - check the lights in the northwest corner of the U.S.

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and southwest corner of Canada. If we can see up that high into the northern hemisphere. Other than that, we'll be on the flight plan.

07 12 22 21 CC

Roger. For your information, the laser from McDonald Observatory in West Texas will be up from about 181 hours and 30 minutes, on for 1 hour. You should be able to spot the earth out of the number 1 window every time you pass roll 357 degrees and then, of course, you're in West Texas. Over.

07 12 22 47 CDR

Okay. Thank you.

07 12 23 07 CMP

How about the number 5 window?

07 12 23 16 CC

Stand by a minute.

07 12 23 24 CC

Roger. For the number 5 window. That'll be - every time you pass 230 degrees in roll. Over.

07 12 23 32 CMP

Beautiful. Thank you.

07 12 23 36 CMP

You guys are on your toes down there.

07 12 23 39 CC

Roger. - -

07 12 23 40 CDR

You have a new, new star chart. You must have a new, new star chart. Huh?

07 12 23 45 CC

Oh, we got a fresh, fresh FAO here.

07 12 36 56 CDR

Houston, Apollo 11. How much longer do you want us to keep charging battery B?

07 12 37 17 CC

11, this is Houston. Nominally we're looking for about another hour and a half, but what we'd like to do is continue charging until shortly before you turn in for the night. Over.

07 12 37 30 CDR

That'll be fine. Are you going to want to charge A again at all?

07 12 37 36 CC

Negative, 11.

07 12 37 40 CDR

Okay.

07 12 42 18 CC

11, this is Houston. At about 180 45, we'll be handing over from Goldstone to Honeysuckle, and I'm handing over to Charlie. See you when you get back. Over.

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07 12 42 33 CDR

Okay, Bruce. Good night. Thank you.

07 12 42 35 CC

Roger. Good night.

07 12 42 36 CMP

Thank you very much, Bruce. It's been a pleasure working with you.

07 12 42 38 CC

Have a nice trip down.

END OF TAPE

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07 13 26 46 CMP

Houston, Apollo 11. Over.

07 13 26 55 CC

Apollo 11, Houston. Go ahead.

07 13 27 02 CMP

Roger, Houston. For RETRO, I have the anticipated location of all the entry stowage, and I suggest you pull out the entry checklist, and we'll go through those maps in the front of it.

07 13 27 19 CC

Apollo 11, Houston. Could you stand by just a few minutes? Charlie and Flight are out getting a weather briefing. They'll be back shortly.

07 13 27 33 CMP

Is this Ken?

07 13 27 35 CC

Say again?

07 13 27 40 CMP

Is this Owen?

07 13 27 42 CC

No, this is Chuck Lewis. Charlie Duke is out with Flight getting a weather briefing right now.

07 13 27 49 CMP

Okay. They're out drinking coffee. I know.

07 13 27 52 CC

(Laughter) They'll be back momentarily.

07 13 35 55 CC

Hello, Apollo 11. Houston. Over.

07 13 36 00 CMP

Roger, Houston. Apollo 11. Did you get the word on the entry checklist?

07 13 36 05 CC

Roger, Mike. We sure did. We're ready to talk about it, if you are. Over.

07 13 36 13 CMP

I think the quickest thing is to go through page by page, the first part of the entry checklist where it has a map. Starting on the page with compartment L2 and L3. Are you with me?

07 13 36 25 CC

Roger. With you.

07 13 36 28 CMP

Okay. L2 is as shown. L3 is as shown; there is about half the food remaining in L3.

07 13 36 35 CC

Roger.

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07 13 36 36 CMP

Where it says - where it says "And note," the CMP PGA is located in the L shaped bag with the other two PGA's. The LM shield was jettisoned with the - Correction, the CMP's helmet shield was jettisoned with the LM, and his helmet and gloves, instead of being in the sleep restraint, are in the hatch bags.

07 13 37 06 CC

Okay. Let's see now. Your PGA is in the L shaped bag with the other two PGA's, and your helmet and gloves are in the L shaped bag instead of the sleep restraint.

07 13 37 21 CMP

The helmet and gloves are in the hatch bag, the great big bag that's underneath the left hand couch that you put the hatch in.

07 13 37 30 CC

Roger. I thought I - That's what I copied. Okay. Go ahead.

07 13 37 37 CMP

Okay. The next page is identical except a nitpicking point: out R1 we got the entry checklist. Other than that it is identical, and the third page has got some changes.

07 13 37 49 CC

Go ahead.

07 13 37 50 CMP

In A1 - Are you with me? I'm over there in compartment A1, now.

07 13 37 56 CC

Go ahead, Mike. Over.

07 13 38 04 CMP

In compartment A1, the 16 millimeter magazine will be located in window number 4 instead of 5. Tissue dispensers; there is only one of them left. And compartment U3, the 16 millimeter bracket is on window 4, and the PGA bag - add the CMP's PGA, plus add two LCG's. And compartment A8 delete two LCG's, add one PPK, making a total of four, and add 10 pounds of LM miscellaneous equipment. We told you five the other day. We think ten is probably closer. Over.

07 13 38 57 CC

Copy.

07 13 39 04 CMP

And that's all the changes on that page. Ready for the next page?

07 13 39 07 CC

Roger. Go ahead, Mike.

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07 13 39 12 CMP

On your next page, in compartment B1, we estimate about 15 percent of that food is remaining. In B2 we took PPK out of there and put trash in it. In B3, the 16 millimeter cable, the 18 millimeter lens, and the right angle mirror are on window number 4. And that there brings you all up to date.

07 13 39 42 CC

Roger. How about the LEVVA's, Mike? Where did you put those? Over.

07 13 39 53 CMP

They're in the hatch bag.

07 13 39 56 CC

Roger. Stand by. Our only concern, 11, is with the stuff you got in the hatch bag. That's pretty big bulk between you and A8, and we'd like to talk about moving that over to the sleep restraint. If you will stand by. I'll verify that. Over.

07 13 40 16 CMP

Okay.

07 13 41 16 CC

11, Houston. Our recommendation on the gear you got in the helmet bag - correction, hatch bag, would be to remove that stuff and put it in the sleep restraint under the right couch. The reason is that the hatch bag straps are only configured for zero g, and it is a pretty difficult job getting it lashed down. With the gear in the sleep restraint, it's a pretty standard lash down procedure, and you could also use the Beta cord that you have on board. You concur? Over.

07 13 42 03 CMP

Yes. We'll look at it, Charlie, and let you know.

07 13 42 06 CC

Roger. And I got a couple of other things, Mike. We need to terminate battery B charge at this time, and also, the weather is clobbering in at our targeted landing point due to scattered thunderstorms. We don't want to tangle with one of those, so we are going to move the - your aim point uprange. Correction, it will be downrange, to target for 1500 nautical mile entry so we can guarantee uplift control. The new coordinates are 13 degrees, 19 minutes north, 169 10 minutes west. The weather in that area is super. We got 2000 scattered, 8000 scattered with 10 miles visibility and 6 foot seas and the Hornet is sitting in great position to get to that targeted position. Over.

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07 13 43 21 CMP

Roger.

07 13 51 59 CC

Apollo 11, Houston. Some of the general last minute updates here. On the entry, we had told you on the camera to set it at 50 feet. It turns out the biggest number on the camera is 25 feet, so just set it at infinity. Over.

07 13 52 19 CMP

Roger. Infinity.

07 13 57 42 CC

Hello, Apollo 11. Houston. We're ready to put you to bed and say good night, if you give us your crew status report and verify that you changed out the CO2 canister a moment ago. Over.

07 13 57 5 CDR

Stand by.

07 14 00 43 CDR

Okay, Charlie. Crew status report follows: CDR 11023, CMP 10025, LMP 09027. Canister change complete.

07 14 01 01 CC

Roger. Thank you very much there.

07 14 01 02 CDR

All men okay.

07 14 01 03 CC

Roger. Thank you. Could you give us an onboard readout, please, sir?

07 14 01 08 CDR

Stand by. Okay. BAT C 37, PYRO BAT A 37, BAT B 37, RCS A 51, B 63, C 62, D 58.

07 14 01 26 CC

Roger. Copy. Thank you much.

07 14 03 47 CC

Apollo 11, Houston. It's good night from the White Team for the last time. We'll be off when you wake up in the morning. It's been a pleasure working with you guys. It was a beautiful show from all three of you. We appreciate it very much, and we'll see you when you get out of the LRL. Over.

07 14 04 04 CDR

Okay, Charlie. Thanks to you and all the White Team for a great job down there all the way through. Thank you.

07 14 04 11 CMP

Outstanding.

07 14 04 13 LMP

... very much, Charlie. Thanks.

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07 14 04 16 CC

Thanks to you guys, too.

07 14 04 36 CC

And, 11, Houston. Mike, you get your chance at landing tomorrow. No go around.

07 14 04 44 CMP

Roger. You're going to let me land closer to Hawaii, too, aren't you?

07 14 04 47 CC

That's right, sir.

07 14 07 59 CC

11, Houston. We got some word just a moment ago that the McDonald Observatory is - said they had picked up the spacecraft in their telescope. Over.

07 14 08 09 CDR

Outstanding. We have been looking for their laser but haven't had much luck yet.

07 14 08 16 CC

Roger. We'll pass it on to them, Neil. Thank you.

END OF TAPE

Tape 118/1 Page 604

REST PERIOD - NO COMMUNICATIONS

Tape 119/1 Page 605

REST PERIOD - NO COMMUNICATIONS

Tape 120/1 Page 606

REST PERIOD - NO COMMUNICATIONS

Tape 121/1 Page 607

REST PERIOD - NO COMMUNICATIONS

Tape 122/1 Page 608

07 21 28 35 CDR
Hello, Houston. Apollo 11.

07 21 28 39 CC
Apollo 11, Houston. Go.

07 21 28 43 CDR
Roger. Good morning. What's the status on midcourse 7?

07 21 28 47 CC
Roger. We were going to let you sleep in until about 190 hours. Midcourse 7 is not required.

07 21 28 54 CDR
Okay. Thank you.

07 22 19 07 CC
Apollo 11. Good morning from Houston. Over.

07 22 19 12 CDR
Good morning, 11.

07 22 19 15 CC
Roger. We saw you up stirring around, and we thought that you were probably eating your breakfast there. Just in general, we'll probably start coming up with the uplink of the state vectors and the target loads and what have you at about 190 50, somewhere in that area, and get you started to work.

07 22 19 35 CDR

Okay.

07 22 19 36 CC

And in the meantime, while you're eating your breakfast there, I've got the Maroon Bugle all standing by here to give you the morning news.

07 22 19 45 CDR

Glad to hear it.

07 22 19 48 CC

Okay. Apollo 11 remains the prime story with the world awaiting your landing today at about 11 49 a.m. Houston time. In Washington, House tax reformers have fashioned a provision which would make it impossible for wealthy individuals to avoid income tax entirely through tax free investments or special allowances. Under the proposal tentatively adopted by the House Ways and Means Committee, everyone would pay taxes on at least half of their income.

07 22 20 25 CDR

Hang on a minute.

07 22 20 30 CC

Roger. Standing by.

07 22 22 28 CDR

Okay. Okay, Ron. We're ready to go again. Thank you.

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07 22 22 36 CC

Roger. Continuing with the Maroon Bugle. President Nixon surprised your wives with a phone call from San Francisco just before he boarded a plane to fly out to meet you. All of them were very touched by your television broadcast. Jan and Pat watched from Mission Control here. The launch of Intelsat from the Cape was postponed for the fourth time last night. The problem was said to be a malfunctioning nitrogen regulator in the second stage of Delta. A new attempt will be made to launch it tonight. The research submarine Ben Franklin, which is studying the Gulf Stream, set a record by drifting 24 hours from 10 to 100 feet above the ocean floor in 1300 feet of water off the Georgia coast. The mission is led by Jacques Picard. Wally Schirra has been elected to a 5 year term on the board of trustees of the Detroit Institute of Technology. He will serve on the Institute's development committee. Air Canada says it has accepted 2300 reservations for flights to the Moon in the past 5 days. It might be noted that more than 100 have been made by men for their mothers in law. And finally, it appears that rather than killing romantic songs about the Moon, you have inspired hundreds of song writers. Nashville, Tennessee, which probably houses the largest collection of recording companies and song publishers in the country, now reports it is being flooded by Moon songs. Some will make it. The song at the top of the best sellers list this week is, "In the year 2525." Morning Bugle. Out.

07 22 24 51 CDR

Thank you very much, Ron.

07 22 31 42 CDR

Houston, crew status report: 5.5 7 5.5.

07 22 31 52 CC

Apollo 11, Houston. Roger. We copy. And I have your consumables update, if you're ready to copy.

07 22 32 00 CDR

Go ahead.

07 22 32 01 CC

Roger. GET 189 plus 00: RCS total minus 1 percent; Alfa minus 11; Bravo plus 10; Charlie minus 1; Delta minus 1; H2 total minus 0.76 pounds; oxygen total plus 17.6 pounds. Over.

07 22 32 41 CDR

Okay. It doesn't look like we're going to be able to get quite back on the flight plan.

(GOSS NET 1)

APOLLO 11 AIR-TO-GROUND VOICE TRANSCRIPTION

07 22 32 46 CC

Not quite; just about though.

END OF TAPE

Tape 123/1 Page 610

07 22 45 13 CC

Apollo 11, Houston. Request P00 and ACCEPT, and we'll send your REFSMMAT, state vector, and entry target load. Over.

07 22 45 23 CDR

You have it.

07 22 45 29 CC

Roger. It'll be coming up.

07 22 48 04 CC

Apollo 11, Houston. Can you tell us where the visor assemblies ended up, there?

07 22 48 12 CDR

We're going to follow your suggestion and stow them under right hand couch.

07 22 48 17 CC

Roger. Mighty fine. Break. The weather forecast in the landing area right now is 2000 scattered, high scattered, 10 miles. The wind about 080 at 18 knots. You'll have about 3- to 6 foot waves. Your Delta H is plus 10 feet. And it looks like you'll be landing about 10 minutes before sunrise. Over.

07 22 48 49 CDR

Okay. Sounds good.

07 22 48 52 CC

Roger.

07 22 50 31 CC

Apollo 11, Houston. All three loads are in. The computer is yours. Over.

07 22 50 38 CDR

Roger.

07 22 50 40 CC

And Mike, if you're on loop there, to extend the range and the constant g reentry, here, I've got a little procedure, if you would like to listen to it.

07 22 50 56 CMP

Stand by one.

07 22 50 57 CC

Roger.

07 22 51 01 CMP

I'm right in the middle of my orange juice. Be with you in about 5 minutes.

07 22 51 04 CC

Sure, no problem, standing by.

07 22 52 24 LMP

Houston, Apollo 11. Hey, Ron, I wonder if you could give us a good Navy explanation for this Delta H time. Over.

Tape 123/2 Page 611

07 22 52 35 CC

Roger. Let me think about it, and I'll come back.

07 22 52 38 LMP

You too, huh?

07 22 52 41 CC

(Laughter) Right.

07 22 52 48 LMP

Collins has got one, but I'm not sure I buy it.

07 22 58 16 CC

Apollo 11, Houston.

07 22 58 21 LMP

Go ahead.

07 22 58 22 CC

Roger, 11. We don't have to worry about it any more. The altimeter out there is now standard, 29.92; but basically what it means is that if I give you a plus 10 feet, for instance, that means that you will hit the water with the altimeter reading 10 feet. Over.

07 22 58 41 CMP

All right.

07 22 58 43 LMP

Ah, Collins was wrong.

07 23 43 31 CC

Apollo 11, Houston. I have your entry PAD. Over.

07 23 43 42 LMP

Stand by.

07 23 43 46 CC

Roger. Standing by.

07 23 43 54 LMP

Okay, I'm ready to copy.

07 23 43 57 CC

Roger. Entry PAD: area is the mid Pacific, roll 000, 152, 001, GET 194 46 06, 267, latitude plus 1332, minus 16917, 064, 36194, 649, range to go 14045, 36275, 195 03 06, 00 28, DL max 154, 084, 22400, 18000, D0 400, 02 13, 00 17, 03 51, 09 02, sextant star 45 0189, 277, boresight star, none available, lift vector up. Comments: GDC align, Vega and Deneb, roll 078, pitch 223, yaw 340. Additional comments: Use nonexit EMS pattern, EI minus 30, horizon check GET 194 33 06. Pitch 298. You'll get P65, but no P66. Additional note: Initial bank angle in P67 may not be full lift. Apollo 11, Houston. Read back.

07 23 48 46 LMP

Okay, Ron, For MIDPAC: 000, 152, 001, 194, 46 06, 267, plus 1332, minus 16917, 064, 36194, 649, 14045, 36275, 195 03 06, 0028, 154, 084,

Tape 123/3 Page 612

2240, 180, 400, 02 13, 00 17, 03 51, 09 02, 45, 0189, 277, none available, lift vector up, GDC align, Vega and Deneb, roll 078, pitch 223, yaw 340. Use nonexit EMS. EI minus 30, horizon check 194 33 06, pitch 298. Initial bank angle in P67 may not be full lift, and we will get P65 but no P66.

07 23 50 30 CC

Apollo 11, Houston. Roger. On your GDC align pitch, it should be 233, 233 in the pitch. Over.

07 23 50 41 LMP

Okay. I've got a 233.

07 93 50 47 CC

Also your DL and MAX and MIN, I'm sure. are 22 400 and 18 000. Over.

07 23 50 56 LMP

Yes. That's right.

07 23 50 58 CC

Okay. If you'll dig out your entry checklist there on page E6 1, I'll update your RETRO times there for the various altitudes. Over.

07 23 51 10 LMP

Okay. Go ahead.

07 23 51 14 CC

Okay. On page E6 1, your RRT is 07 20, your 50K is 08 16; 40K is 08 30; your 24K is 09 02; and your 10K is 09 51. Over.

07 23 52 06 LMP

Okay. RRT, 07 20, 50 000, 08 16. That's - 07 20 is - is the time of steam pressure peg from RRT; and 40 000, 08 30; 24 000, 09 02; 10 000, 09 51.

07 23 52 48 CC

11, Houston. You started out right, and then the numbers you read back were correct; but I didn't get your comment in between there.

07 23 52 58 LMP

I assume that - all I wanted to know is that first time, 07 20, that's the time of steam pressure peg. Right?

07 23 53 04 CC

That's affirmative.

07 23 53 06 LMP

Okay.

07 23 58 05 CMP

Houston, Apollo 11. Ron, I'm ready to copy your message about the constant drag level.

Tape 123/4 Page 613

07 23 58 13 CC

Okay, Mike. Of course, this is in the event the G&N and the EMS quits and you have to fly the constant g; and what we're trying to do is extend the constant g range from 1100 to 1500 miles. We've run this procedure in the simulator, and it works fine. Basically, I'll go through it - just go through it, and then if you have any questions come back. But it's the same lift vector up until MAX g, and then lift vector down, and then modulate the lift vector until g dot goes to zero. Okay. This procedure is essentially the same so far. And then hold g dot zero until you pass the RETRO elapsed time of V circular; and then after you pass this RETRO elapsed time of V circular, roll to a gimbal angle of 45 degrees, and then hold this constant bank angle of 45 degrees until you come to the RETRO elapsed time of drogues. Over.

07 23 59 44 CMP

Okay. It sounds straightforward enough. Understand constant g backup backup procedure, lift vector up until MAX g and then lift vector down; then modulate until bank angle until g dot equals zero. Maintain g dot equals zero until subcircular, then roll 45 degrees and hold until drogue time. Over.

08 00 00 07 CC

Okay. That's mighty fine, Mike. That's correct.

END OF TAPE

Tape 124/1 Page 614

08 01 01 57 CMP

This entry time line is my kind of time line. Nice and slow.

08 01 02 03 CC

Okay, 11. Houston. Roger. It sure is. EECOMM is anxiously awaiting his big moment here for the logic sequence check whenever you're ready.

08 01 02 14 CDR

Okay. We'll be ready for that in just a flash.

08 01 02 17 CC

Roger.

08 01 02 28 CC

Apollo 11, Houston.

08 01 02 31 CMP

Go ahead, Ron.

08 01 02 32 CC

This is Jim, Mike. Backup crew is still standing by. I just want to remind you that the most difficult part of your mission is going to be after recovery.

08 01 02 42 CMP

Well, we're looking forward to all parts of it.

08 01 02 45 CC

Please don't sneeze.

08 01 02 53 CMP

Keep the mice healthy.

08 01 03 03 CMP

The Earth is really getting bigger up here and, of course, we see a crescent.

08 01 03 08 CC

Yes.

08 01 03 12 CMP

We've been taking pictures and we have four exposures to go, and we'll take those and then pack the camera.

08 01 05 18 CMP

Houston, Apollo 11. We're ready for the logic check whenever you are. We're standing by to arm the logic. We've got ELS logic on, ELS AUTO, and all the circuit breakers in.

08 01 05 30 CC

Apollo 11, Houston. Roger. You can press on with the SECS logic.

08 01 05 35 CMP

Okay. Logic 1 coming on.

08 01 05 37 CMP

MARK it.

08 01 05 39 CMP

Logic 2 coming on.

Tape 124/2 Page 615

08 01 05 40 CMP
MARK it.

08 01 05 50 CC
Apollo 11, Houston. Logic checks good. You're GO for PYRO ARM.

08 01 05 56 CMP
Thank you, sir.

08 01 07 09 LMP
Houston, Apollo 11 has got VHF A Simplex on whenever you want to make a COMM check.

08 01 07 20 CC
Apollo 11, Houston. Roger. You faded out a little bit there, Buzz. I understand you have the VHF Simplex A on now. Is that correct? Over.

08 01 07 29 LMP
That affirmative. VHF Simplex A and we're TR on VHF.

08 01 07 35 CC
Roger. Mighty fine. We'll watch it as you are coming on in and let you know when the intelligibility is up. We'll make a voice check with you at that time.

08 01 07 50 CDR
Houston, Apollo 11. I've been holding here in SCS control MINIMUM DEADBAND RATE LOW with the limit cycle on, just as a matter of curiosity, if you guys wanted some fuel numbers from that.

08 01 08 07 CC
11, Houston. Roger. We copy and we've been figuring it out.

08 01 08 13 CDR
Okay.

08 01 08 18 CMP
It's a pleasure to be able to waste gas.

08 01 08 23 CC
Roger. That's affirmative.

08 01 16 11 CC
Apollo 11, Houston with a little recovery force information. Over.

08 01 16 17 CMP
Go ahead.

08 01 16 18 CC
Roger. The Hornet is on station just far enough off the target point to keep from getting hit. Recovery 1, or the chopper, is there; they're on station. And Hawaii Rescue 1 and 2, the C 130's, are within 40 minutes of your target point. Over.

Tape 124/3 Page 616

08 01 16 50 CMP
Sounds good. Thank you.

08 01 25 08 CC
Apollo 11, Houston.

08 01 25 11 CDR

Go ahead.

08 01 25 13 CC

Roger. Just to get a little downlink here to check out our VHF: I show us about an hour and 37 minutes, approximately, from entry interface. Over.

08 01 25 26 LMP

Okay. That's about right.

08 01 25 28 CC

Okay. Looks like we're together on that, and I guess we're standing by for you to whip into the entry attitude.

08 01 25 37 LMP

Okay. We've just been taking a couple of last minute pictures. We've finished the EMS entry check, primary water EVAP activation.

08 01 25 46 CC

Roger. Mighty fine.

08 01 31 22 CC

Apollo 11, Houston.

08 01 31 26 CMP

Go ahead.

08 01 31 28 CC

Roger, Mike. We recommend the left VHF antenna for VHF.

08 01 31 33 CC

And this is your friendly backup CMP. Have a good trip, and may - remember to come in BEF.

08 01 31 42 CMP

You better believe. Thank you kindly.

08 01 31 48 CMP

We can see the Moon passing by the window and it looks what I considered to be a correct size.

08 01 33 26 LMP

Houston, Apollo 11. Like to switch to S band OMNI C. I just did a minute ago, and noticed a loss of signal strength, over.

08 01 33 34 CC

Roger, Apollo 11. Go ahead and try it again now that you're in attitude.

08 01 33 42 LMP

Roger. Going OMNI C.

08 01 37 10 CC

Apollo 11, Houston.

Tape 124/4 Page 617

08 01 37 31 CC

Apollo 11, Houston. Recommend antenna Bravo. Over.

08 01 41 08 CC

Apollo 11, Houston. Recomend antenna Bravo, or at least a better one. Over.

08 01 47 35 CC
Apollo 11, Houston.

08 01 47 39 CDR
Go ahead, Ron.

08 01 47 40 CC
Roger. Faces are red here. We lost data with you there for a while. Did you do the P52? Over.

08 01 47 47 CDR
That's affirmative, we completed the P52. We'll give you the data from it in just a second. We passed our sextant star check at entry attitude, and right now we're maneuvering to our first horizon cheek pitch attitude of 298 degrees.

08 01 48 05 CC
Roger. Copy that, 11.

END OF TAPE

Tape 125/1 Page 618

08 01 58 53 CC

Apollo 11, Houston. About 4 minutes to 1 hour, and I'll give you a mark at 1 hour. Was a command module preheat necessary? Over.

08 01 59 03 CMP

Negative that.

08 01 59 06 CC

Roger. Copy. Negative command module preheat.

08 02 02 06 CC

Apollo 11, Houston.

08 02 02 09 CMP

Go ahead.

08 02 02 11 CC

Roger. We don't want to jettison the hydrogen tank that stratified, so could you cycle the fans in tank 2 please? Hydrogen tank 2.

08 02 02 26 CMP

You better believe, that old service module has taken good care of us. We want to take good care of it.

08 02 02 30 CC

It sure has, hasn't it.

08 02 02 33 CMP

It's been a champ.

08 02 04 48 CC

11, Houston. I'll give you a time hack at 58 minutes to go. It's about 15 seconds yet.

08 02 04 57 CMP

Thank you.

08 02 05 04 CC

Stand by.

08 02 05 07 CC

MARK.

08 02 05 08 CC

58 minutes.

08 02 05 13 LMP

Roger.

08 02 10 13 CC

Apollo 11, Houston.

08 02 10 16 LMP

Go ahead, Houston. Apollo 11.

08 02 10 17 CC

Roger. We have our update at the state vector out there for you. Request P00 and ACCEPT. Over.

08 02 10 28 LMP

Okay. You've got it.

08 02 10 32 CC
Okay. Here it comes.

Tape 125/2 Page 619

08 02 11 55 CC
Apollo 11, Houston.

08 02 11 58 LMP
Go ahead.

08 02 12 00 CC
Roger. The computer is yours now. Looks like you're in VHF range, here. So we'll try a VHF check for you. We'll just send VHF up to you. Stand by.

08 02 12 11 LMP
Okay.

08 02 12 25 CC
Apollo 11, Houston. VHF check on Simplex Alfa. Over.

08 02 12 32 LMP
Roger, Houston. Apollo 11, VHF Simplex Alfa, loud and clear. How me? Over.

08 02 12 38 CC
Roger, 11. Houston. You're loud. The standard VHF noise, though, makes you realize that S band is good.

08 02 12 48 LMP
Roger. Understand. Thank you.

08 02 13 19 CC
Apollo 11, Houston. Backup S band now, and we're standing by for command module RCS activation.

08 02 13 27 LMP
Okay. We're just about there.

08 02 15 15 CC
Apollo 11, Houston, you're GO for PYRO ARM.

08 02 15 19 CMP
Thank you, Houston.

08 02 16 36 CC
Apollo 11, Houston. Your command module pressurization looks mighty fine to us.

08 02 16 41 LMP
Looks good here, Ron.

08 02 16 46 CC
And 11, Houston, I've got an update for about four items on your entry PAD.

08 02 16 55 LMP
Ready to copy.

08 02 16 57 CC
Roger. Your MAX g, 063; your NOUN 60, your Gamma, at 400K, 648; your range to go on the EMS, 14033; and your RETRO time for V circular, 02 14. Over.

08 02 17 40 LMP

Roger. Copy MAX g 6.3; R2 at NOUN 60, 6.48; range to go, EMS, 14033; RET V circular, 02 14. Over.

Tape 125/3 Page 620

08 02 17 58 CC

Roger. Readback is correct there.

08 02 24 37 LMP

Houston, Apollo 11.

08 02 24 39 CC

Apollo 11, Houston. GO.

08 02 24 43 LMP

Roger. The first horizon check 194 23 06 at a pitch angle of 298 does not quite fall on the 31 7 line. It's just a little high. It's within 5 degrees tolerance.

08 02 24 57 CC

Apollo 11, Houston. The horizon check there was supposed to be at 33. Over.

08 02 25 05 LMP

Okay. That's fine, sir. Thank you.

08 02 25 07 CC

Roger.

08 02 29 00 CC

Apollo 11, Houston. Command module RCS looks fine to us.

08 02 29 05 CDR

Same here, Ron. Looks very good. Doesn't make as much noise as we thought. Some of them are barely audible.

08 02 29 11 CC

Roger.

08 02 29 16 CC

And 11, Houston. Weather still holding real fine in the recovery area.

08 02 29 21 CDR

Roger.

08 02 29 22 CC

Looks like it's about 1500 scattered, high scattered. And it's still 3 to 6 foot waves.

08 02 29 29 CDR

Hey, that part of it sounds good.

08 02 29 33 CC

Roger.

08 02 30 00 CC

11, Houston, I'll give you another Mark at 33 minutes. Stand by.

08 02 30 07 CC

MARK.

08 02 30 10 CMP

Roger that.

08 02 32 37 CMP

Houston, Apollo 11. Do you have any recommended settings to catch the sunset. Over.

08 02 32 48 CC

Roger. Well, the time is 36 41. And stand by for some settings.

Tape 125/4 Page 621

08 02 32 59 LMP

Okay. I'll probably only be doing it maybe - part of it at six frames a second, some it at one. So I could be changing settings as it goes through.

08 02 33 09 CC

Roger. Copy.

08 02 33 19 CMP

And the horizon check passes; it's right on the money.

08 02 33 24 CC

Hey, mighty fine. Sounds good.

08 02 35 07 CC

Apollo 11, Houston. On the shooting at the Sun, f:16th at 1 over 250.

08 02 35 18 LMP

Understand f:16 at 1 over 250.

08 02 35 22 CC

Roger.

08 02 37 05 CMP

And the Sun is going down on schedule. It's getting real dark in here.

08 02 37 11 CC

Apollo 11. Houston. Copy.

08 02 48 54 CC

Apollo 11, Houston. We see you getting ready for SEP. Everything looks mighty fine down here.

08 02 48 59 CMP

Same here, Ron. Thank you.

08 02 50 42 CC

Apollo 11, Houston. You're still looking mighty fine from here. You're cleared for landing.

08 02 50 47 CDR

We appreciate that, Ron. Thank you.

08 02 50 49 CMP

Roger. Gears down and locked.

08 02 50 52 CC

Roger.

08 02 50 54 CMP

Thank you.

08 02 54 40 LMP

Houston, we got the service module going by. A little high and a little bit to the right.

08 02 54 49 CC
Roger. Thank you.

08 02 54 53 CMP
And it's rotating just like it should be. Thrusters are firing.

08 02 55 05 CC
Good. It's got a lot of gas there to burn out, too.

Tape 125/5 Page 622

08 02 55 07 LMP
It's coming across now from right to left.

08 02 55 13 CC
Houston. Roger.

08 02 57 07 LMP
Houston, Apollo 11. You going to turn on the tape recorder shortly?

08 02 57 19 CC
11, Houston. You can go ahead and turn it on.

08 02 57 24 LMP
Okay. I'll have to go to command reset to do that.

08 02 57 34 CC
11, Houston. That's negative. All you have to do is turn it on. That'll be fine.

08 02 57 44 LMP
I guess I don't know how to turn it on, then. I got PCM, ANTILOG RECORD, FORWARD; high bit rate, and barber pole.

08 02 58 03 CC
11, Houston. We'll send the ON command from down here, see if it works.

08 02 58 07 LMP
Okay.

08 02 58 56 LMP
Got our friend the Moon whipping by the field of view right now.

08 02 59 01 CC
Roger. Copy.

08 03 00 32 CC
11, Houston. We'll have you for about 3 or 4 minutes through Redstone and then pick you up after blackout through ARIA.

08 03 00 41 LMP
Roger.

08 03 01 48 LMP
Houston, Apollo 11. I'm going to go to COMMAND RESET and turn the tape on.

08 03 01 54 CC
...

08 03 02 00 CC
11, Houston. Recommend negative on that. That will put us in low bit rate.

08 03 02 12 LMP

Okay. I already put it to COMMAND RESET, but I still have barber pole on the tape. And now my switch is high bit rate.

08 03 02 22 CC

Okay. That will be fine. On 225, there, if you can reach it, Buzz, the last two circuit breakers in the second row from the bottom, punch those in.

Tape 125/6 Page 623

08 03 02 42 CC

And 11, Houston, don't mess around with that 225 there.

08 03 02 48 LMP

Okay.

08 03 03 01 CC

And 11, Houston. You're going over the hill there shortly. You're looking mighty fine to us.

08 03 03 06 CDR

See you later.

08 03 07 15 CC

Apollo 11, Houston through ARIA.

08 03 07 37 CC

Apollo 11, Houston through ARIA.

08 03 08 10 CC

Apollo 11, Houston through ARIA 4.

08 03 09 08 CC

Apollo 11, Houston through ARIA. Standing by. Over.

08 03 09 45 CC

Apollo 11, Houston in the blind. AIR BOSS has visual contact.

08 03 11 18 CC

Apollo 11, Houston. Standing by for your DSKY reading. Over.

08 03 11 49 CC

Apollo 11, Houston. Stand by for your miss distance. Over.

08 03 12 04 CC

Apollo 11, Houston. Standing by for your DSKY reading. Over.

08 03 12 09 CC

DROGUES.

08 03 12 22 CC

Apollo 11, Houston. Your DSKY reading, please. Over.

08 03 12 31 CDR

Roger. We were *** right on ... 169, 17.

08 03 12 53 CDR

Reading 1330, 1069, 15.

08 03 15 03 HORNET

Apollo 11, Apollo 11. This is Hornet. Hornet. Over.

08 03 15 07 CDR
Hello, Hornet. This is Apollo 11 reading you loud and clear. Our position 1330, 16915.

08 03 15 19 HORNET
11, Hornet. Copy 1330, 1675. Any further data? Over.

*** Three asterisks denote clipping of words and phrases.

Tape 125/7 Page 624

08 03 15 24 CDR
330, 169, 15.

08 03 15 31 HORNET
Do you have an error?

08 03 15 39 HORNET
We have that. And what is condition of the crew?

08 03 15 45 HORNET
11, this is Hornet. What's your error of splashdown and condition of crew? Over.

08 03 15 52 CDR
The condition of crew *** 4000 - 3500 feet, on the way down.

08 03 16 00 HORNET
11, this is Hornet. Copy. 11, Hornet. What's your splashdown error? Over.

08 03 16 06 SC
Okay. Our splashdown error is by latitude, longitude, 1330 16 *** 15. That's ***

08 03 16 19 HORNET
Hornet. Roger, out.

08 03 16 44 CDR
Okay, Hornet. Apollo 11 is out.

08 03 16 48 HORNET
RoRer. 2500 on chutes.

08 03 17 00 SWIM 1
SWIM 1 has ... contact 150, holding ... 190.

08 03 17 13 HORNET
Hornet. Roger. Out.

08 03 17 19 SWIM 1
... bearing 200.

08 03 17 24 CDR
Apollo 11 at 1500 feet.

08 03 17 27 HORNET
Hornet. Roger. Copy. Out.

08 03 17 32 SWIM 1
Swim 1. Have a visual dead ahead about a mile?

08 03 17 42 HORNET

Hornet. Roger.

08 03 17 44 ...

... spacecraft.

08 03 17 48 SWIM 1

Roger. This is SWIM 1, Apollo 11.

08 03 17 54 CDR

... 300 feet.

08 03 17 56 SWIM 1

Roger. You're looking real good.

08 03 18 18 SWIM 1

SPLASHDOWN!

*** Three asterisks denote clipping of word or phrases.

END OF TAPE